MAY 24, 1945

American Machinist

TECHNOLOGY DEPT.

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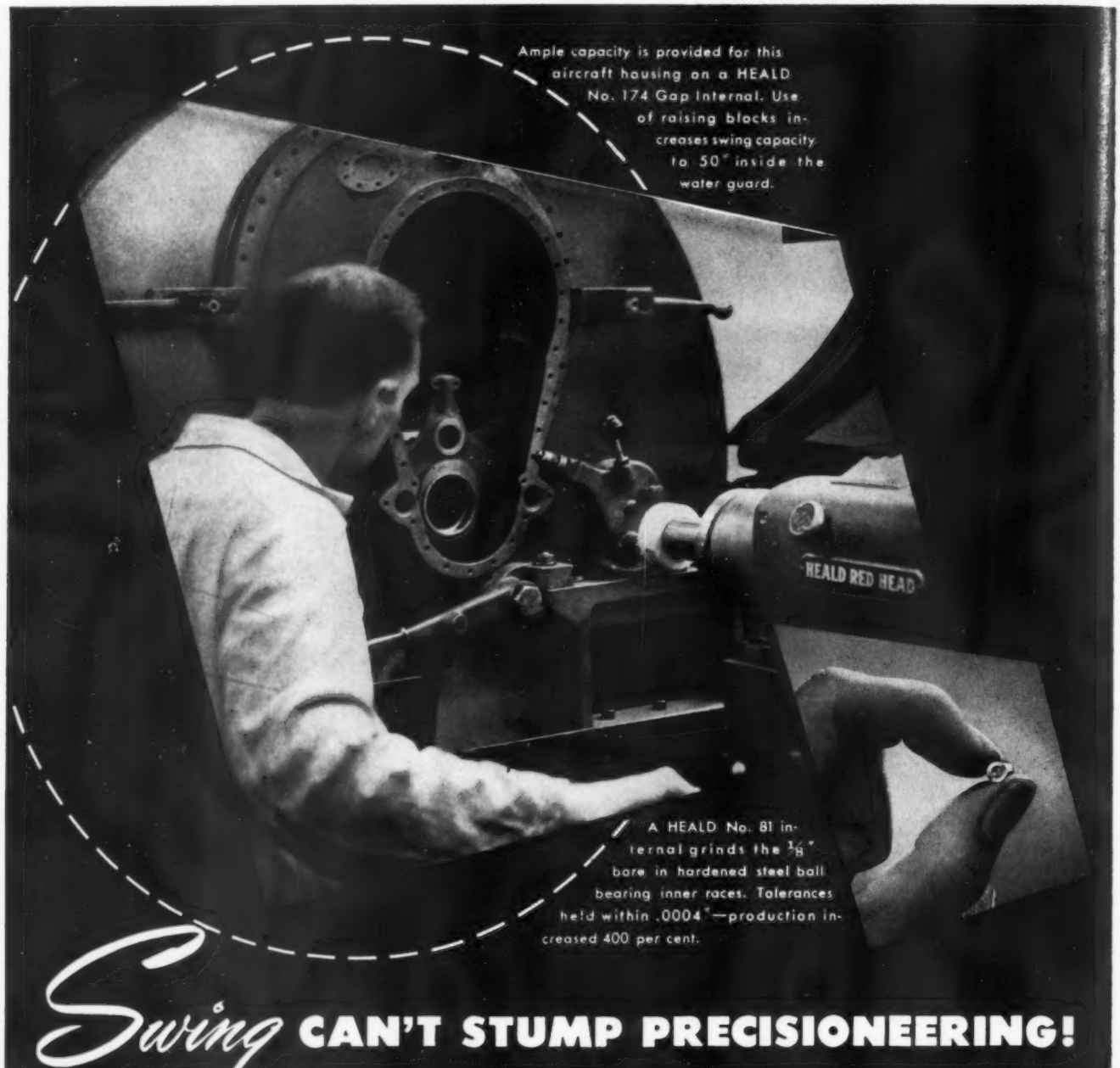
TO THE AMERICAN PEOPLE:

Your sons, husbands and brothers who are standing today upon the battlefronts are fighting for more than victory in war. They are fighting for a new world of freedom and peace.

We, upon whom has been placed the responsibility of leading the American forces, appeal to you with all possible earnestness to invest in War Bonds to the fullest extent of your capacity.

Give us not only the needed implements of war, but the assurance and backing of a united people so necessary to hasten the victory and speed the return of your fighting men.

William D. Leahy
Douglas MacArthur
Ernest J. King
Dwight D. Eisenhower
C. W. Nimitz
H. H. Arnold


Ample capacity is provided for this aircraft housing on a HEALD No. 174 Gap Internal. Use of raising blocks increases swing capacity to 50" inside the water guard.
HEALD RED HEAD
A HEALD No. 81 internal grinds the 1/8" bore in hardened steel ball bearing inner races. Tolerances held within .0004"—production increased 400 per cent.

Swing CAN'T STUMP PRECISIONEERING!

Aircraft housings that call for a 50" full swing; ball bearing races ¼" O. D., with a ⅛" diameter bore—it's all the same to precisioneering!

The size of a part is no problem on a Heald Internal Grinding Machine—custom-tailored for the job. It can be engineered to meet your specific needs for closest tolerances with high volume production. 250 precisioneers at precision headquarters—backed up as they are with long experience in *your* industry—will see to that!

If it's a job of internal or surface grinding; boring, turning, facing, chamfering or grooving that demands utmost precision and a fast production pace—HEALD has the answer.

And if you're a hard man to convince, so much the better! Come up to precision headquarters and see for yourself—or call in your local Heald man to prove to you that we can give you *more precision faster.* You'll be glad you did!

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

HEALD

means more precision faster!

INTERNAL AND SURFACE GRINDING MACHINES
BORE-MATIC PRECISION FINISHING MACHINES

TECHNOLOGY DEPT

American Machinist

May 24, 1945

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PRACTICAL IDEAS

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★ New Address_____
★ New Company Connection_____
★ New Title or Position_____

American Machinist Chips

Feature Attractions . . . In this issue, *American Machinist* editors present several outstanding articles worthy of your particular attention.

The lead article starts a series on "Molding Thermosetting Plastics." This initial installment deals with compression molding and describes the different types of molds, the molding processes and the considerations in selecting the type of mold for a given job. The series is being written by D. M. Buchanan, Chief Development Engineer of the Bakelite Corporation.

Next you will find another solid-meat "Blue Section" . . . a 12-pager on the subject of FASTENERS. This illustrated feature deals with the wide range of fastening devices and emphasizes new developments in joining practices. Here is something most every production executive will want to read for its interest and practical utility. Reprints available at 15c each.

A 4-page article, prepared by a representative of Adel Precision Products Corporation, deals with the value of production illustrations in the assembly of small precision parts. It describes the use of three-dimensional drawings at various assembly stations. The drawings are prepared from actual parts and the illustrators confer at length with shop foremen to obtain complete details of assembly techniques. Drawings are prominently displayed at each work station and are invaluable guides to novices and reminders for experienced operators.

Good Stuff . . . Among the many publications streaming across the desks of *American Machinist* editors are two recent ones on which we would like to comment.

One is *Firepower*, The Ordnanceman's Journal, produced by the Office, Chief of Ordnance, U. S. Army. Chock full of facts, figures and very interesting stories of ordnance operations on the fighting fronts, it is a bang-up job.

Space will not permit a thorough reporting, but you might be interested in the "Tally of War from D-Day to the End of 1944 in the European Theatre of Operations." $500,000,000 worth of equipment was irreparably lost or destroyed in battle and must be written off the ledger. This included 6,205 combat vehicles and 34,250 general purpose vehicles.

On the other hand, in December alone, U. S. communications zone ordnancemen completed a total of 173,807 separate repair jobs and managed to reclaim $50 worth of ordnance through field maintenance against every dollar's worth written off as scrap.

The other publication is entitled "Future of Welding", produced by Victor Equipment Company of the West Coast. Profusely illustrated, this booklet gives some fascinating examples of old time welding apparatus and techniques . . . along with a contrasting description of today's methods and equipment as illustrated by Victor products. It is really worthwhile seeing.

Surplus Property . . . Many of us have been watching with interest how the Treasury Department has been promoting spot sales of surplus property in various regions of the Office of Surplus Property. The cover of one such piece of literature is reproduced below.

Most of the notices we have seen to date have featured Farm and Construction Machinery sales — although there are some items being offered of possible interest to metal-working.

Now that the Department of Commerce has taken over this particular function, we hope they will continue and expand the live-wire merchandising tactics of the Treasury.

Incidentally, you may or may not know that the Surplus Property Division of R. F. C. has been not only sending out lists of various types of equipment for sale but is also distributing questionnaires on which potential buyers can indicate products they might need.

Reading Time . . . How much time do you spend, on the average, with each issue of *American Machinist?*

This question appears on a questionnaire sent out regularly by the *American Machinist* Editorial Research Department to groups of readers . . . along with other questions trying to determine what our subscribers like and don't like in the publication so that we can constantly strive for improvement.

You might be interested to know that replies received during 1944 averaged the following figures:

More than 2 hours	46%
Between 1 and 2 hours	33%
About ¾ of an hour	8%
About ½ hour	8%
Less than ½ hour	5%

We believe this is pretty strong evidence that *American Machinist* is really studied as a source of news and ideas useful to Metal-Working production men.

Hush Money . . . We suppose this column has its share of typographical mistakes, and the pot probably shouldn't call the kettle black. However, we couldn't help snickering at an item on the sports page of the *New York Herald Tribune*, which went as follows:

"Byron Nelson won the Charlotte Open Golf Tournament today by defeating Sam Snead four strokes in a second eighteen-hole play-off—a grim match played before an almost silent gallery of $1,500."

We always thought money talked.

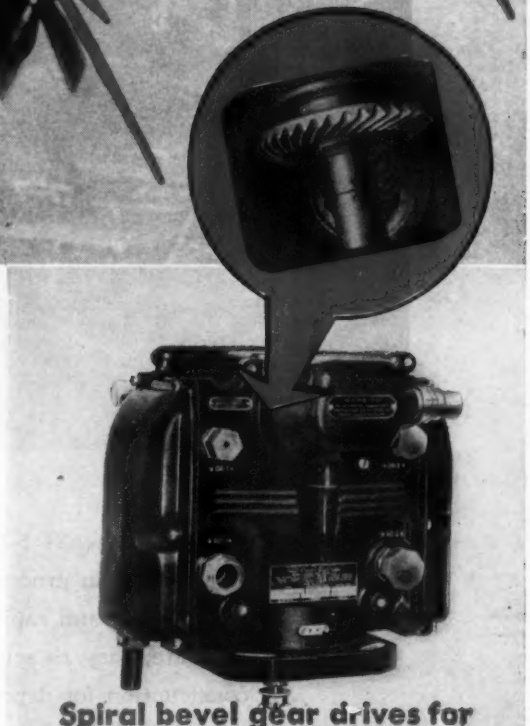
BEVEL GEAR DRIVES — TO *Victory*

International News Photo

40,000 SPARKS PER MINUTE!

Magnetos provide the spark of life upon which aviation engines depend. Spiral bevel gears drive the breaker cams which control the distribution of this spark with split-second timing to each one of the cylinders.

In order to supply this spark at the rate of 40,000 per minute, every minute in the air, these gears must operate with unfailing precision and smoothness at the high speeds required.



Spiral bevel gear drives for aircraft engine magnetos

Spiral bevel gears produced on Gleason machines are meeting the test daily . . . helping to keep cylinders firing and engines roaring uninterruptedly, both in routine flights and in the stress of dog-fights and bombing runs.

This ability of spiral bevel gears to operate smoothly and dependably at extremely high speeds will be available after the war to bring improved performance to the high-speed drives of the future.

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

THE 1-18's DON'T WASTE TIME . . .

CINCINNATI 1-18 Plain Automatic Miller. Complete information and specifications may be obtained by writing for Catalog M-848. A brief description of this machine is given in Sweet's Catalog File for Mechanical Industries.

The CINCINNATI 1-18 Plain Automatic Miller handles profitably a wide range of small parts, in production runs or job lots, because: (1) Table rapid traverse (300" per minute) and rapid automatic cycles reduce unproductive cutting of air. (2) It's accurate, easy to set up and operate. (3) Ability to take a heavy cut. (4) Sturdy construction for dependable service over long periods of time. ¶ In the illustration shown on the opposite page, the 1-18 is milling both ends of a reverse shifter bracket for automobile transmissions. The special two-station fixture is of the progressive type for cutting one end of part in each station. 1-18's are used extensively for small work pieces for motors, typewriters, cash registers, tabulating and other business machines, small arms, hand tools, etc. ¶ In addition to the advantages enumerated, there are other features about this versatile miller you're going to like. ¶ Perhaps some of your milling operations could be handled faster and more economically on a CINCINNATI 1-18. Our engineers will be glad to talk it over with you.

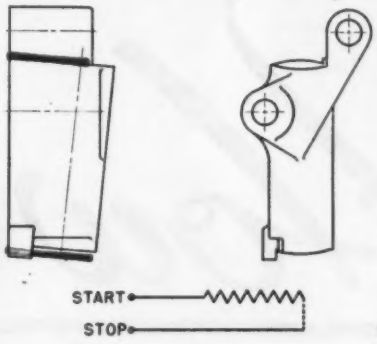
It's the lucky seventh
BUY AN EXTRA BOND!

THE CINCINNATI M

MILLING MACHINES

CINCINNATI

CUTTING AIR!



Automatic cycle diagram and sketch of part showing milled surfaces.

Name of part: Reverse shifter bracket.
Operation: Mill ends.
Material: Cast iron.
Production: 59 pieces per hour.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

How else?

WOULD YOU, OR COULD YOU, INSPECT SUCH PARTS ACCURATELY AND RAPIDLY

The tolerance on the profile of this form ground die section is plus or minus .0005". *Inspection is simple*—the profile is projected at 62½ magnifications upon the 30 inch screen of the Jones & Lamson Optical Comparator and compared with the accurately scribed master outline.

The Jones & Lamson Pedestal Optical Comparator is an essential to the modern tool room. When equipped with all measuring attachments, lateral or vertical dimensions can be measured to within .0001 of an inch, and angles can be measured to within 5 minutes of arc—*accurately and rapidly!*

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.
2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*
3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.
4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.
5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...
VARIOUS COLORS PRINTED ON MILK BOTTLE CAPS ARE REGISTERED ON THE PRINTING PRESS AFTER LOCATING HOLES HAVE BEEN POSITIONED ON THE COMPARATOR.

Photograph courtesy of Star Machine & Tool Company, Cleveland, Ohio

JONES & LAMSON

MACHINE COMPANY

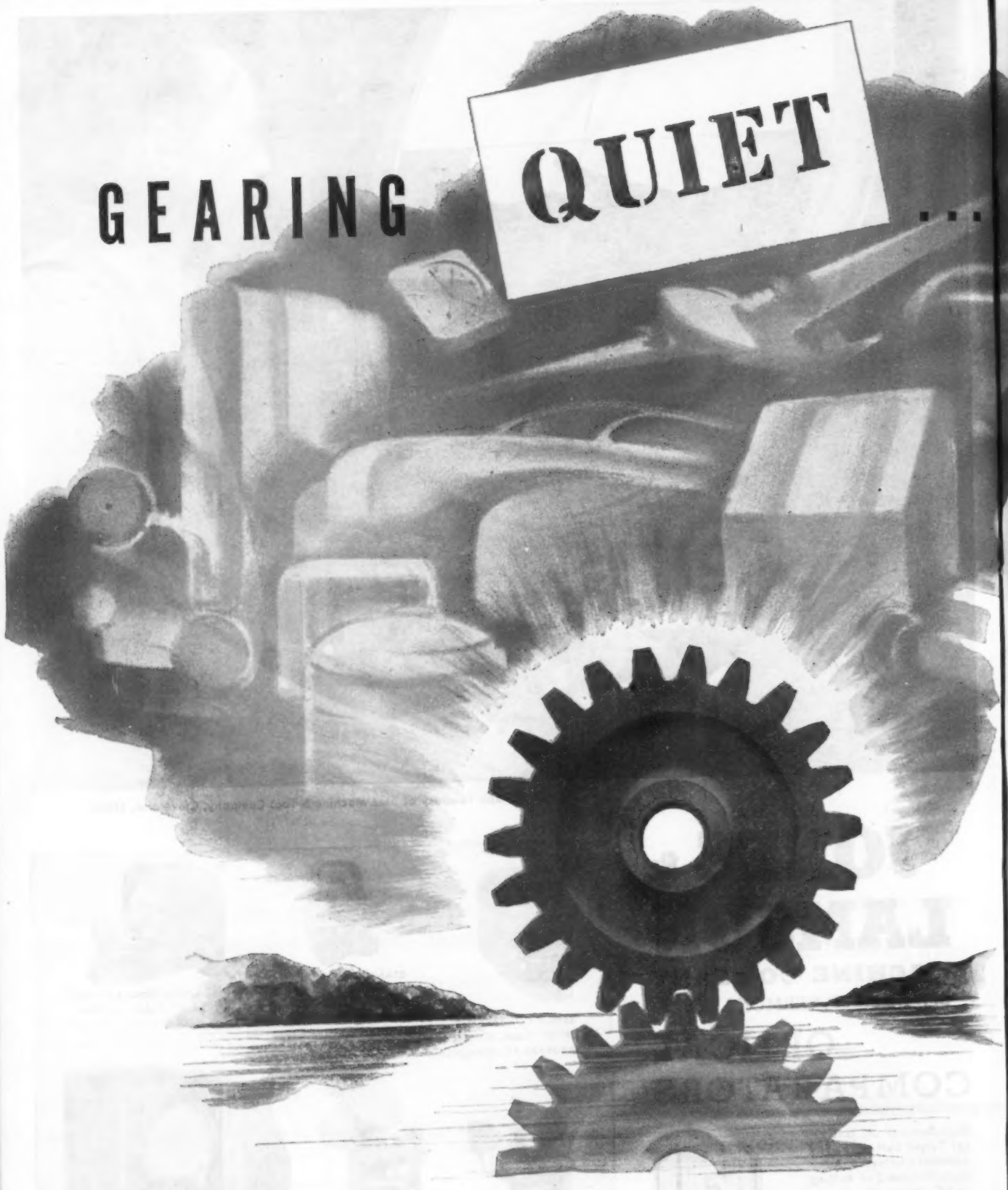
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS
STANDARD BENCH COMPARATOR
BENCH COMPARATOR 14" DIAM. SCREEN
DIRECT PROJECTION COMPARATOR
STANDARD PEDESTAL COMPARATOR
PEDESTAL COMPARATOR 22"—30" DIAM. SCREENS

GEARING QUIET ...



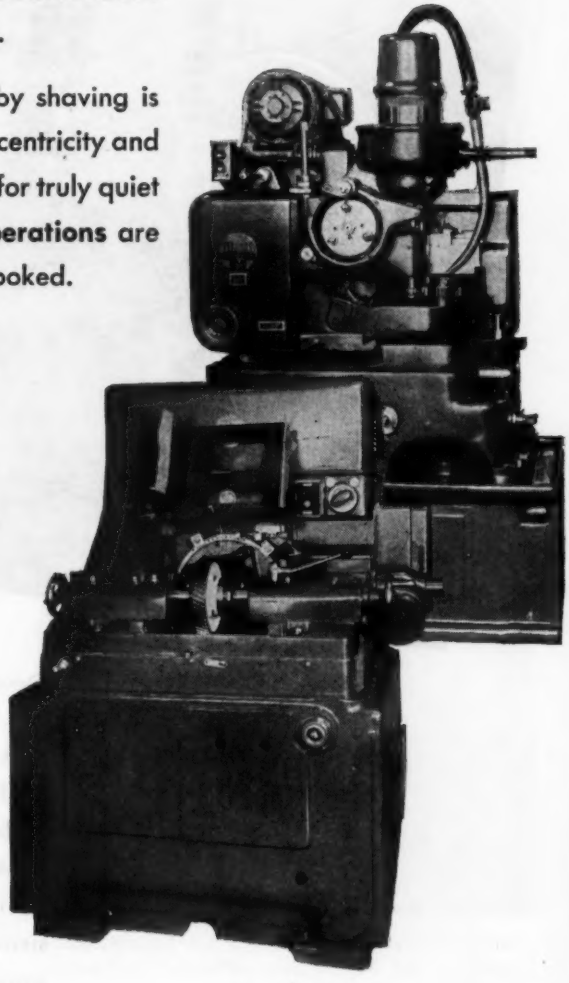
THE FELLOWS METHOD...MACHINES AND TOOLS FOR

TO MODERN DESIGN

Product redesign for competitive post-war selling is as much a challenge to the mechanical engineer as to the industrial designer. For one thing, **noise**, and gear noise in particular, can no longer be tolerated. Products will have to please the ear as much as they delight the eye.

The practical aspect is that your finishing of gear teeth by shaving is almost inevitable—for perfection of involute profile, for concentricity and for tooth-spacing uniformity. When you set your standards for truly quiet gear action, **Fellows Gear Shaving and Preshaving operations** are elements of production economy too important to be overlooked.

Overall costs are critically affected by **the degree of coordination and balance** between these two operations—where accuracy must be controlled within close limits. It seems obvious that two related machines by the same maker, built and tooled to a common standard of precision offer soundest assurance of complete responsibility. Our general catalog "The Fellows Method" will explain. Write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Bldg., Detroit 2, Mich. or 640 West Town Office Bldg., Chicago 12, Ill.



The precision to which gears are cut on the Gear Shaper lessens tool wear in subsequent shaving operations, thus effecting a notable over-all economy. Fellows builds a complete size-range in both Gear Shaping and Shaving equipment.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI CENTERLESS WITH A MINIMUM

Above: The grinding wheel and wheel guard cover have been removed to show the work rest, the overhead equalizing hold-down shoe, and regulating wheel.

CINCINNATI

Development of the setup illustrated in these photographs has taken the awkwardness and uncertainty out of grinding out-of-balance parts. Here two diameters are ground on a tractor steering knuckle made of forged steel. The machine is a CINCINNATI No. 2 Centerless, with a minimum of special equipment consisting of a work rest with equalizing hold-down shoe connected to the infeed lever. ¶ This is an infeed job, employing the upper slide method. That is, after sizing the work, the regulating wheel unit is retracted while the work rest unit remains in position. The equalizing shoe automatically raises as the hand infeed lever is returned to the starting posi-

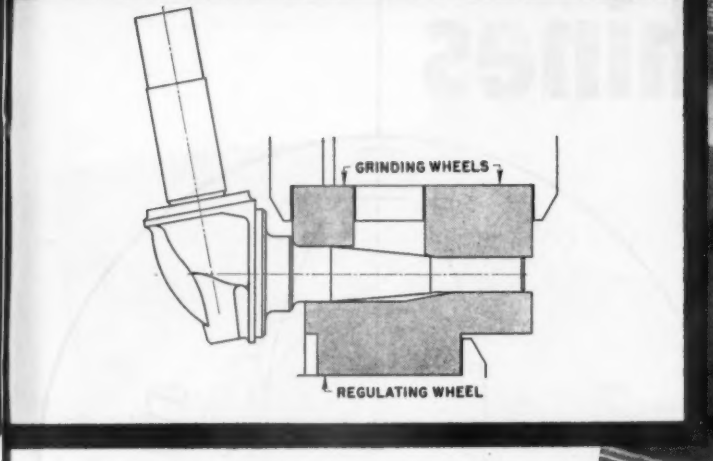
It's the lucky seventh
BUY AN EXTRA BOND!

CINCINNATI

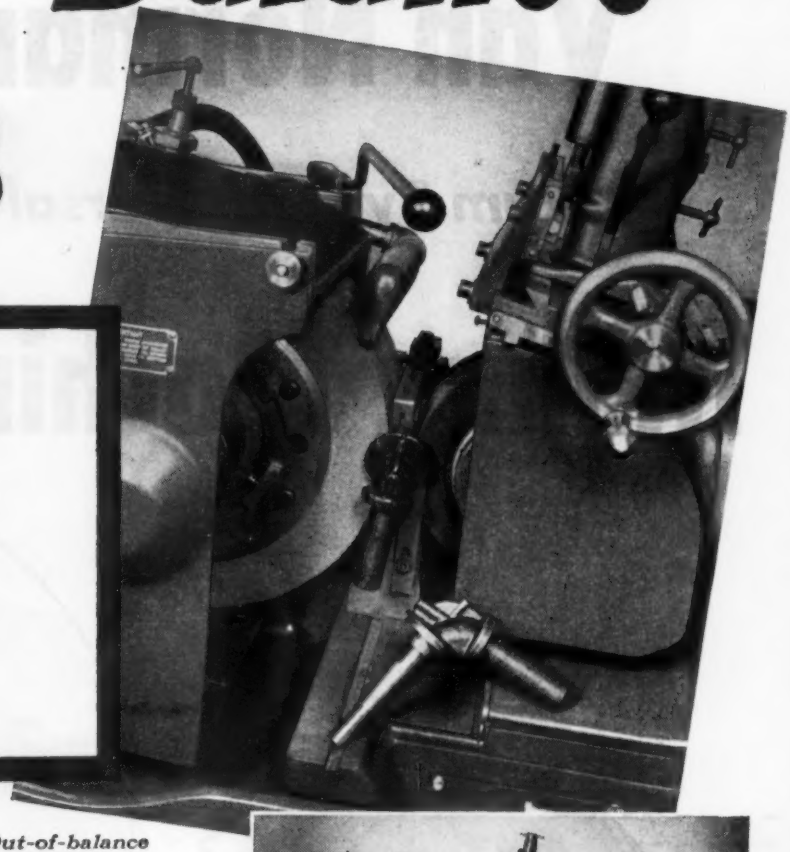
CENTER TYPE GRINDING MACHINES

OF SPECIAL EQUIPMENT GRINDS . . .

Out-of-Balance Parts



Above: Sketch shows arrangement of two grinding wheels and the regulating wheel.



Right above: Out-of-balance part (steering knuckle) in position for grinding.

tion, the work stops rotating, clears both wheels and comes to rest against the stop finger, thus facilitating loading and unloading. ¶ *The work is ground in two passes, rough and finish, with an hourly net production of 78 pieces, and accurate limits of roundness are obtained in spite of the unbalanced condition.* This is another example of the work of Cincinnati Application Engineers in devising methods and equipment for more economical production. ¶ Perhaps some of your grinding operations could be handled more advantageously with a similar setup. Our engineers will be glad to analyze your requirements and give you their recommendations based on twenty years' experience in centerless grinding.

CINCINNATI *No. 2 Centerless Grinder. For complete specifications write for Catalog G-456-2. Sweet's Catalog File for Mechanical Industries gives a brief description.*

GRINDERS INCORPORATED

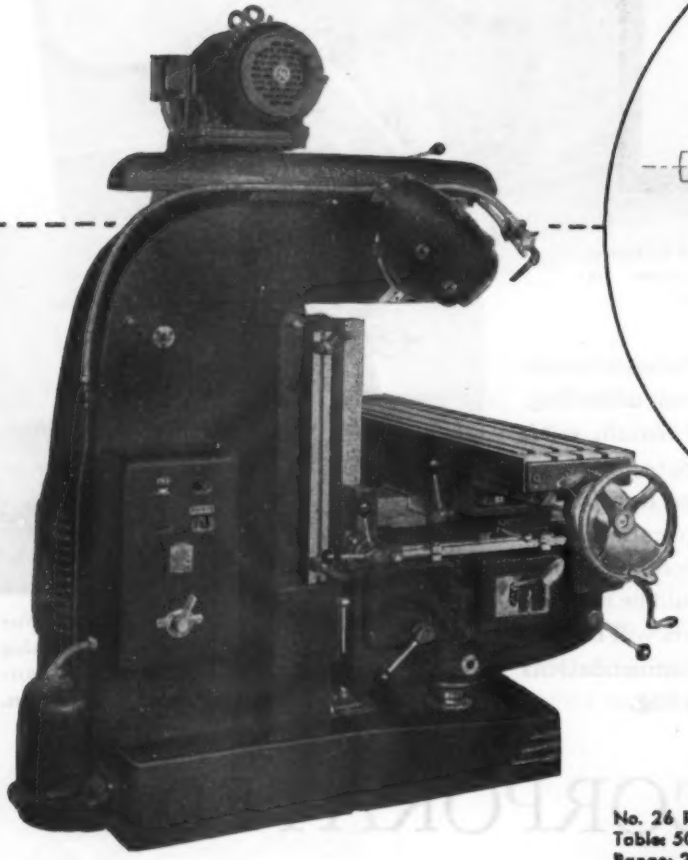
CINCINNATI 9, OHIO, U. S. A.

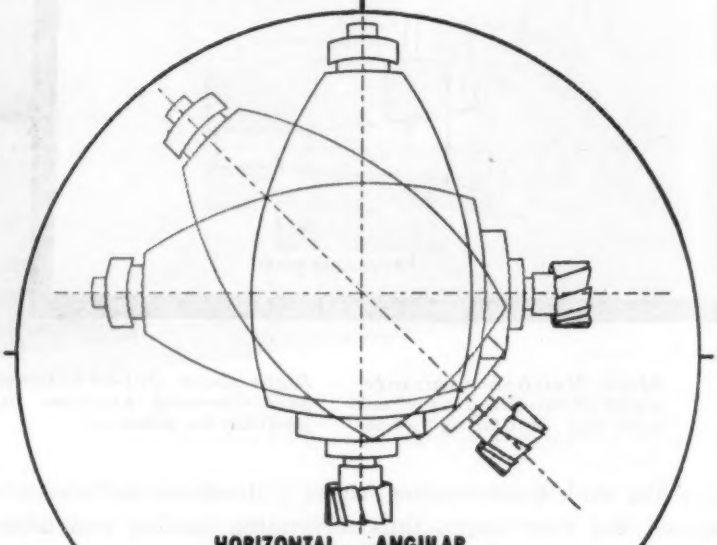
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman

Ram Type Universal

Milling Machines





HORIZONTAL . . . ANGULAR . . . VERTICAL MILLING

One Van Norman Ram Universal Miller gives You the work range of several types of millers.

SPECIFICATIONS:
No. 26 Ram Type Universal Miller
Table: 50" x 12"
Range: 28" longitudinal, 12" across, 18" vertical
18 Speeds: 30 to 1500 r.p.m.
18 Feeds: ⅝" to 32"

Vertical Milling—In the illustration at right, the operator is vertical milling a recess in the workpiece.

Angular Milling—Here, the operator is milling a "V" in the workpiece. Note that the set-up of the work is in the original position.

Horizontal Milling—The operator is completing the job with a face milling operation. One work set-up and simple changes of the versatile cutterhead and sliding ram enables the operator to carry most jobs through to completion on a Van Norman Ram Type Universal Miller.

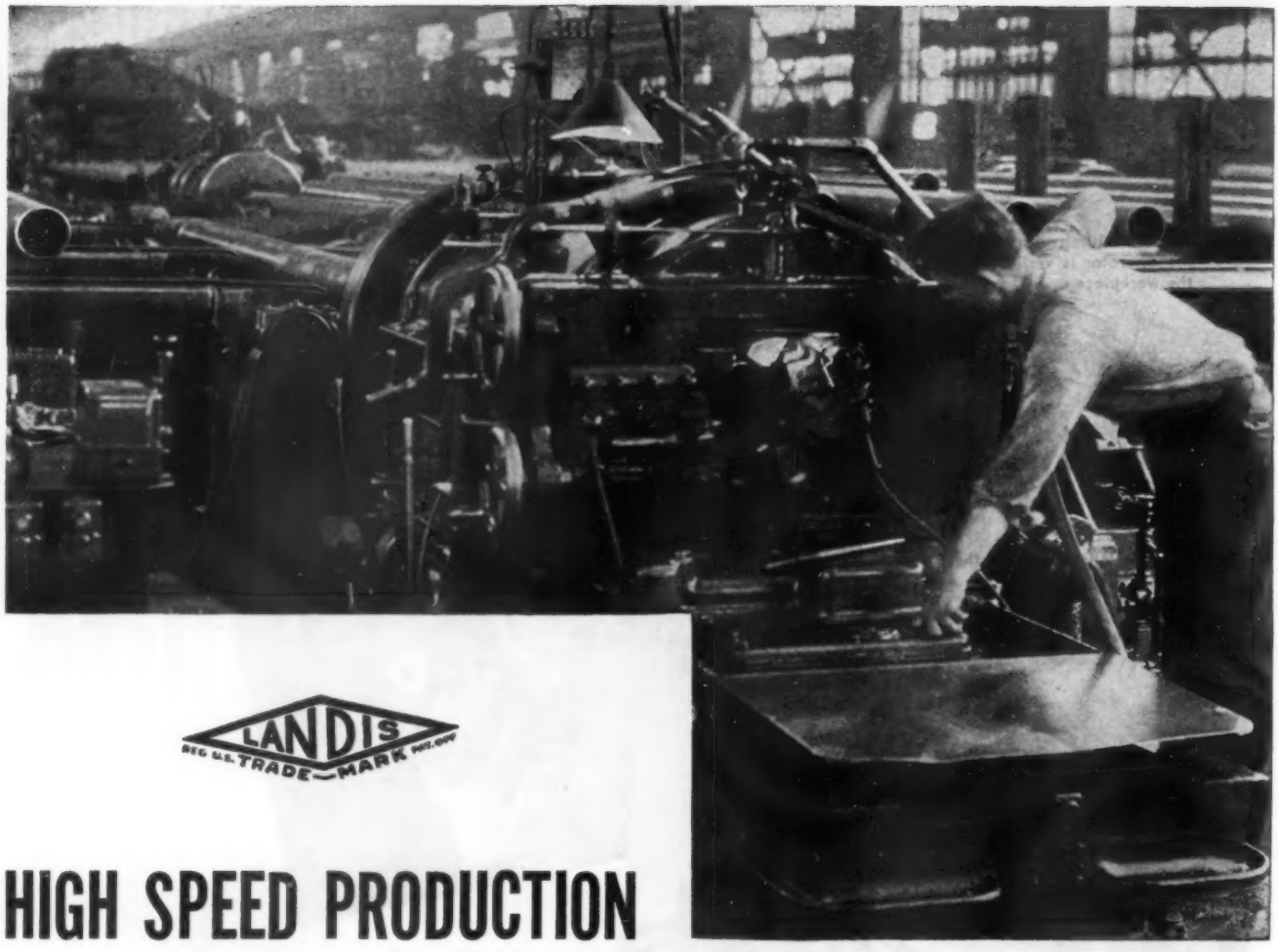
Van Norman Ram Type Universal Milling Machines materially reduce time-wasting reset-ups and cut idle time by as much as 50%.

Here's how.—By simply changing the position of the adjustable cutterhead from horizontal to angular or vertical position . . . you can perform most milling operations on a particular workpiece without a single change of the original set-up. Not only does the adjustable cutterhead enable the operator to complete a job in a shorter time, but because the workpiece stays "put", errors that often accompany work reset-ups are eliminated.

In addition, such Van Norman advantages as directional front and rear controls of all power feeds, large, easy-to-read djals, the extreme ruggedness of the column, ram, saddle and knee assemblies . . . all assure accuracy, economy and maximum production.

THE VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

"It pays to Van Normanize"



LANDIS
REG. U.S. TRADE—MARK PAT. OFF.

HIGH SPEED PRODUCTION IN THREADING OIL WELL TUBULAR GOODS

The Landis Receding Chaser Pipe Machines are geared for high operating speeds, thereby securing maximum production, and at the same time maintaining the exacting accuracy of A.P.I. specifications.

Tube Mills—for threading Oil Well Casing, Tubing and Drill Pipe—depend on the Landis Pipe Machine with Receding Chaser Head for high production, quality thread finish, and low operating cost.

Send for Bulletin C-77

LANDIS MACHINE COMPANY

A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE MARK PAT. OFF. **THREAD TIPS**

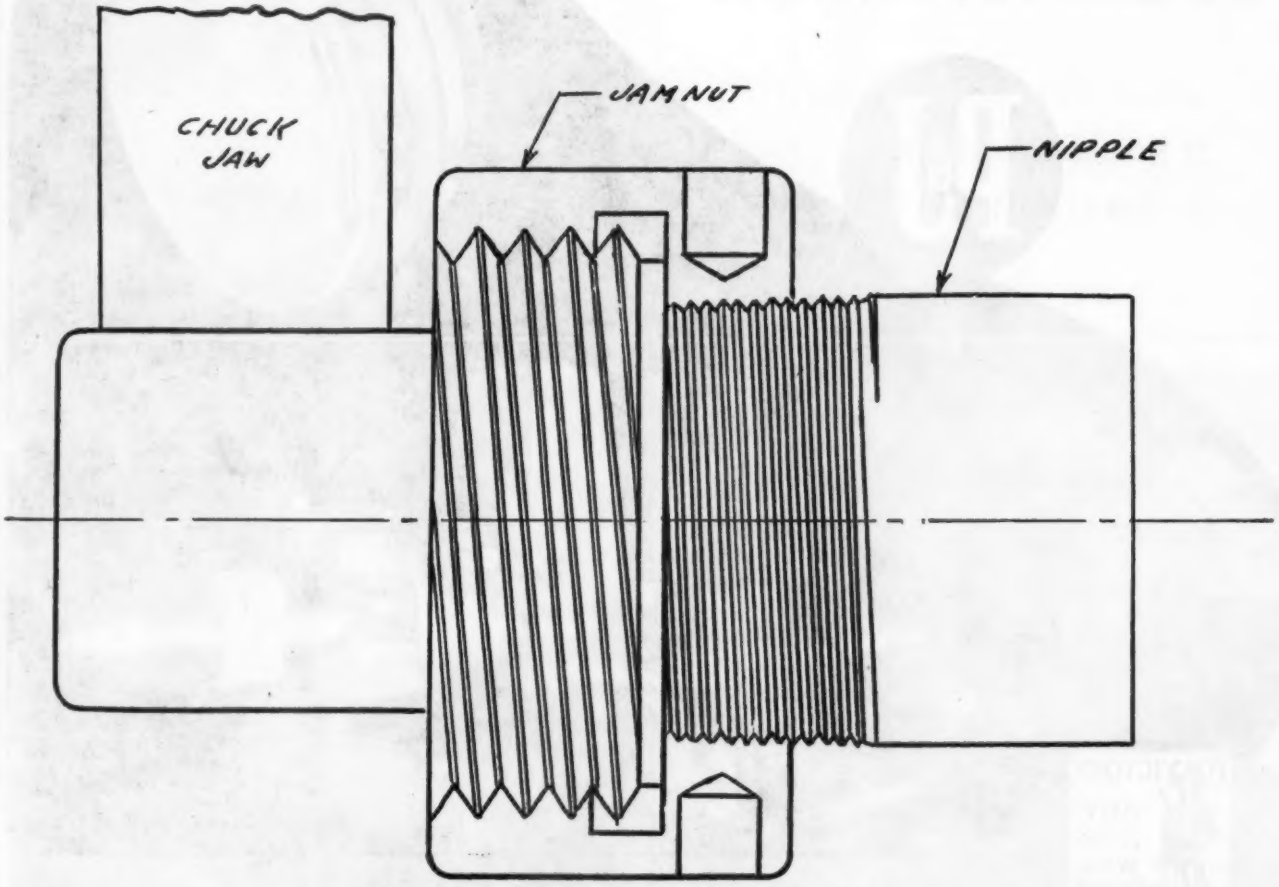
In the Interest of Efficiency, Better Workmanship and Higher Production

NIPPLE CHUCK FOR NIPPLES 2" IN DIAMETER AND UNDER FOR 2" LITTLE LANDIS PIPE MACHINES

To insert nipple, screw jam nut up to shoulder, then screw nipple into holder.
To loosen nipple, back off jam nut, then remove nipple.

One body for all size nipples.

One jam nut is required for each size.



Be Threadwise — Employ LANDIS Long Life Tangential Chasers

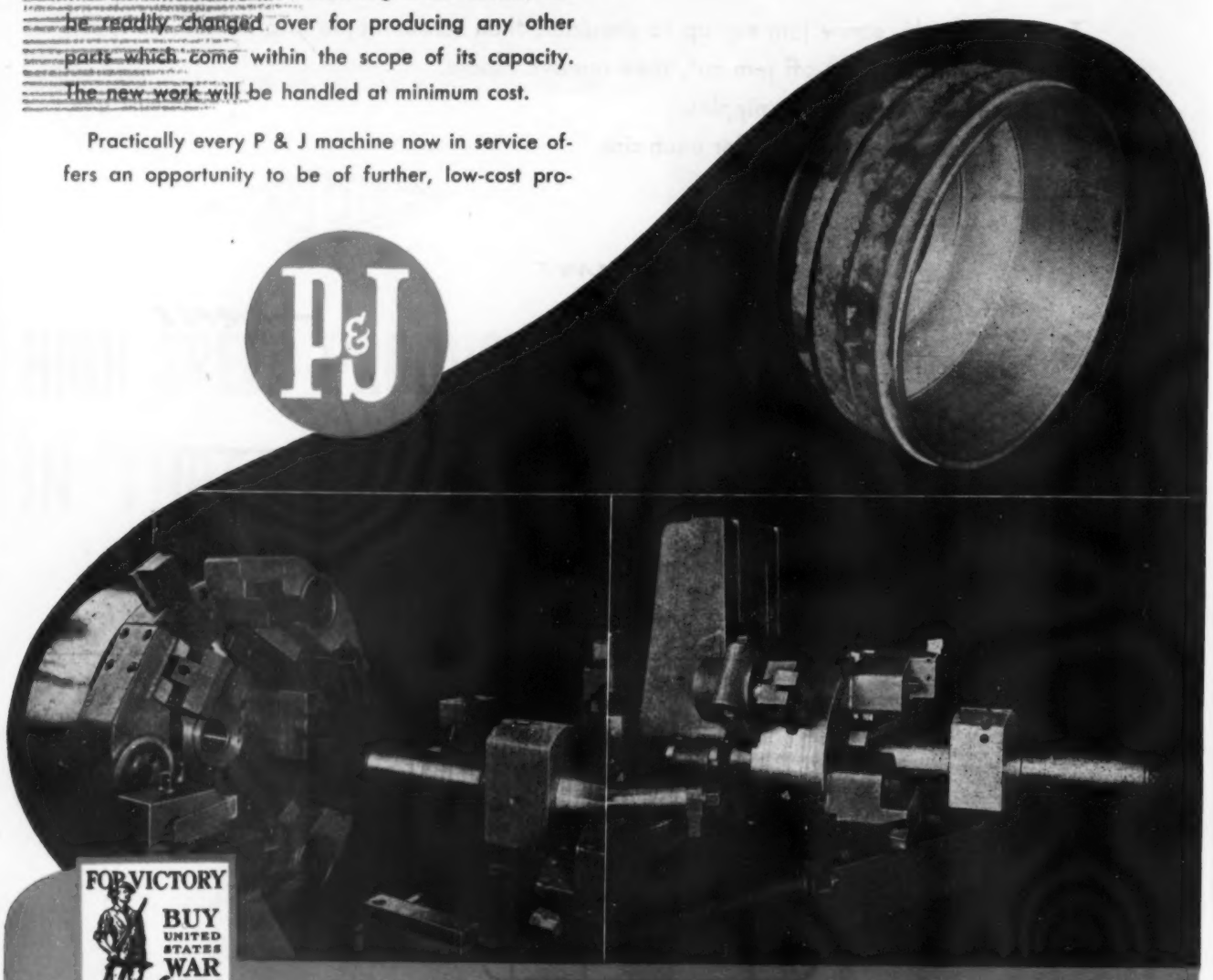
WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

P & J EQUIPMENT CAN BE RE-TOOLED . . . FOR FURTHER LOW-COST PRODUCTION

The need for cost-cutting in the era which lies ahead can be met with existing P & J equipment, because P & J design is such as to facilitate re-tooling. Thus a P & J machine, such as the 6 DRELX shown here tooled for machining brake drums, can be readily changed over for producing any other parts which come within the scope of its capacity. The new work will be handled at minimum cost.

Practically every P & J machine now in service offers an opportunity to be of further, low-cost productive use. Now is the time to consider the part your P & J equipment can play *profitably* in your reconversion program. P & J engineers are at your command to help you re-tool to greatest advantage.

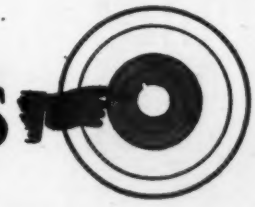


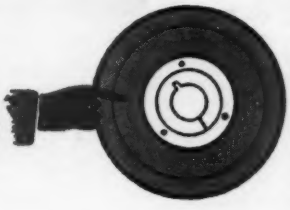
"U. S." Stands for
"UNCONDITIONAL SURRENDER"
Buy More BONDS

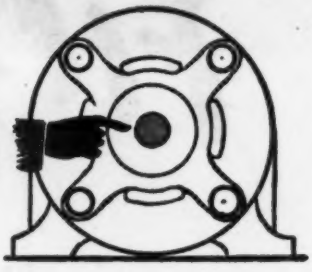
P & J REBUILDING SERVICE Owners of P & J Automatics are invited to investigate P & J's plant facilities for rebuilding their machines to original accuracy and productivity. Re-tooling can be conveniently handled at the time of rebuilding.

POTTER & JOHNSTON MACHINE CO.
PAWTUCKET, R. I.

This locks this to this in 1 quick operation







Allis-Chalmers' new "Magic-Grip" with tapered split bushing is put on, aligned, locked to shaft *as a unit* — making it the fastest mounting and demounting sheave on the market!

1 Place sheave on shaft. Slides on smoothly because clearance is provided by expanded bushing. There's *no* hammering — *no* forcing! Complete sheave and bushing unit comes intact—ready for quick, easy mounting.

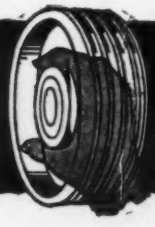
2 Slide to desired position. Sliding easily, sheave can be placed *exactly* according to straight-edge . . . giving you true alignment with resulting smooth performance. A minimum of time is required.

3 Tighten three capscrews — and it's ready to go! Entire sheave is locked securely to shaft and *grips like magic!* No set screws to damage shaft. Send for Bulletin B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1757

Allis-Chalmers Texrope

"MAGIC-GRIP" SHEAVES



ANOTHER LANDIS TOOL *First*

Landis Tool Centerless Thread Grinder complete with built-in wheel crusher. Convenient controls permit adjustments for different sizes of work, rates of feed and position with respect to wheel.

READY NOW TO SPEED WAR PRODUCTION

CHECK THESE ADVANTAGES

GREATER PRODUCTION—Reduced work handling and higher speeds have given production per day increases of from *two to five hundred per cent* over other methods.

SMOOTH SURFACE—Threads produced on the Centerless Thread Grinder have the characteristic smooth surface of a ground finish.

BRIGHT FINISH—Threads ground from hardened stock have a distinctive clean, bright appearance and require no further treatment.

GREATER ACCURACY—Warpage and distortion of threads by final heat treatment eliminated because threads are ground from hardened stock.

CLOSER TOLERANCES—Multi-groove grinding wheel assures that all thread forms will be exactly uniform.

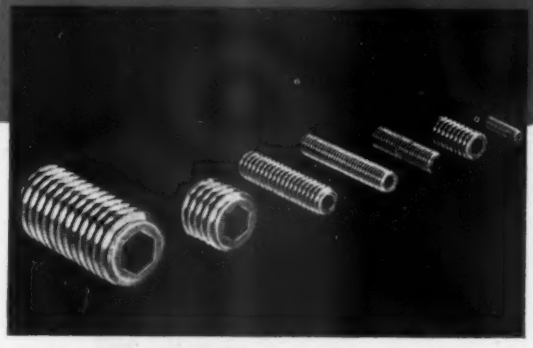
LESS INSPECTION—Gaging of each piece is eliminated. Once the machine is set up and in production, only spot inspection is needed to check wheel wear.

FEWER REJECTS—Elimination of heat treatment distortion together with the accurately formed multi-groove grinding wheel almost entirely eliminates rejects.

LANDIS TOOL *Precision Grinders*

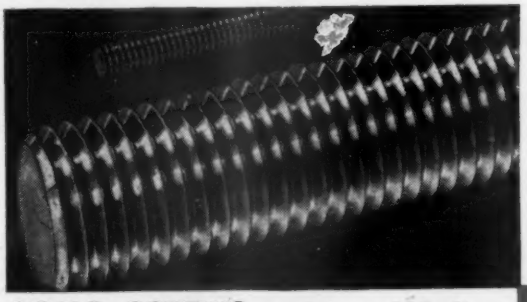
LANDIS TOOL COMPANY WAY

Centerless GROUND THREADS



SOCKET SCREWS—from 1/8" diameter 40 pitch to 5/8" diameter 11 pitch have been ground in production.

THREADED RINGS—hardened steel rings 5" diameter with 16 pitch threads ground in two passes.



LONG SCREWS—12" long 1/4" diameter screws 20 pitch in one pass and 6" long, 1" diameter screws 8 pitch in two passes.

UP TO 500% GREATER PRODUCTION

The new LANDIS TOOL Thread Grinder was developed to meet today's needs for increased production of highly accurate threaded parts. It is another first for LANDIS TOOL in the field of precision thread grinding—introduced *now* to speed production and help win the war. Application of the Thread Grinder to socket screws has been demonstrated by a year of development and production experience in cooperation with a leading manufacturer.

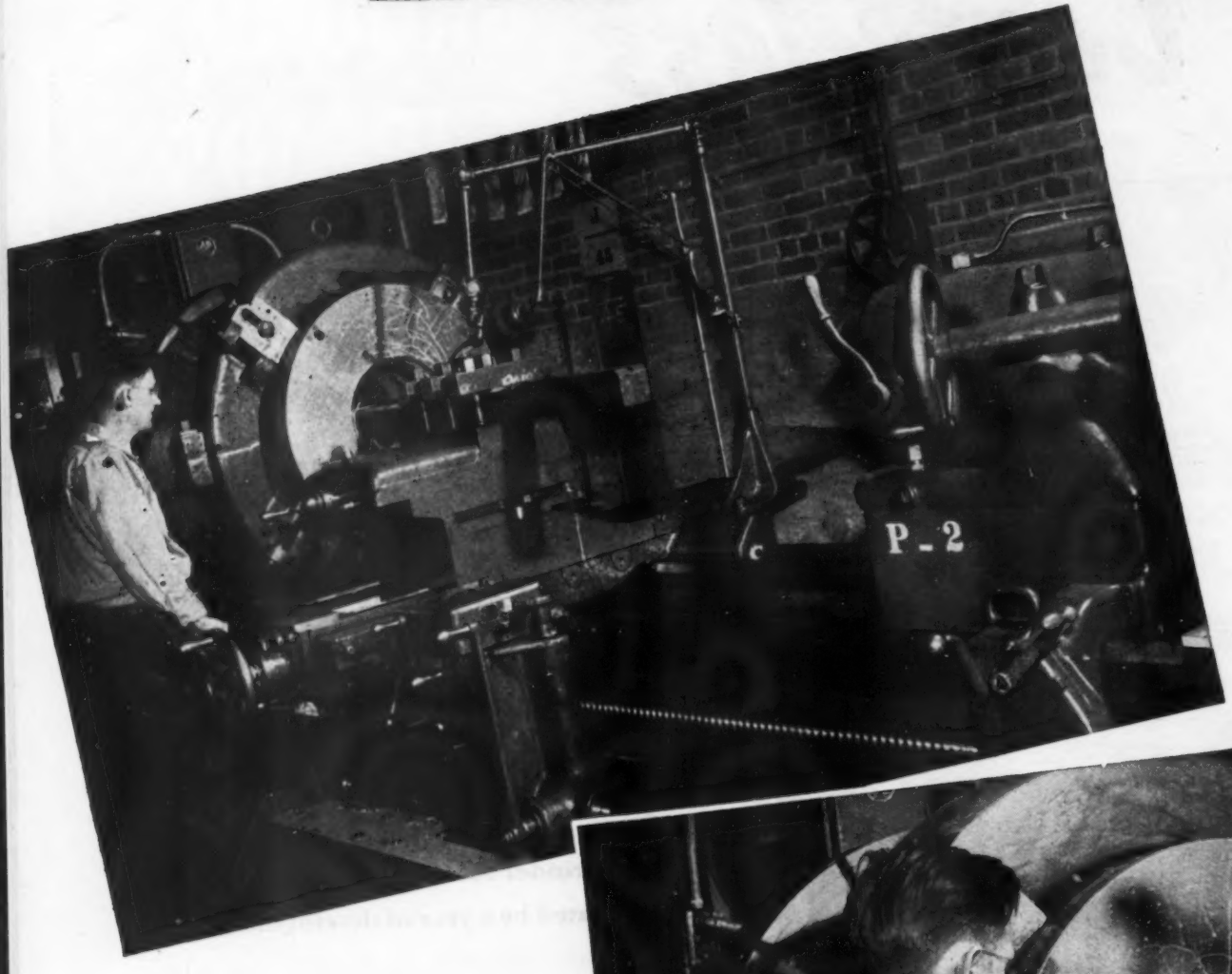
Our engineering department will be glad to consult with you on any of your thread grinding problems and make recommendations on the possibilities of the Centerless Thread Grinder.

23

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

Like all True A



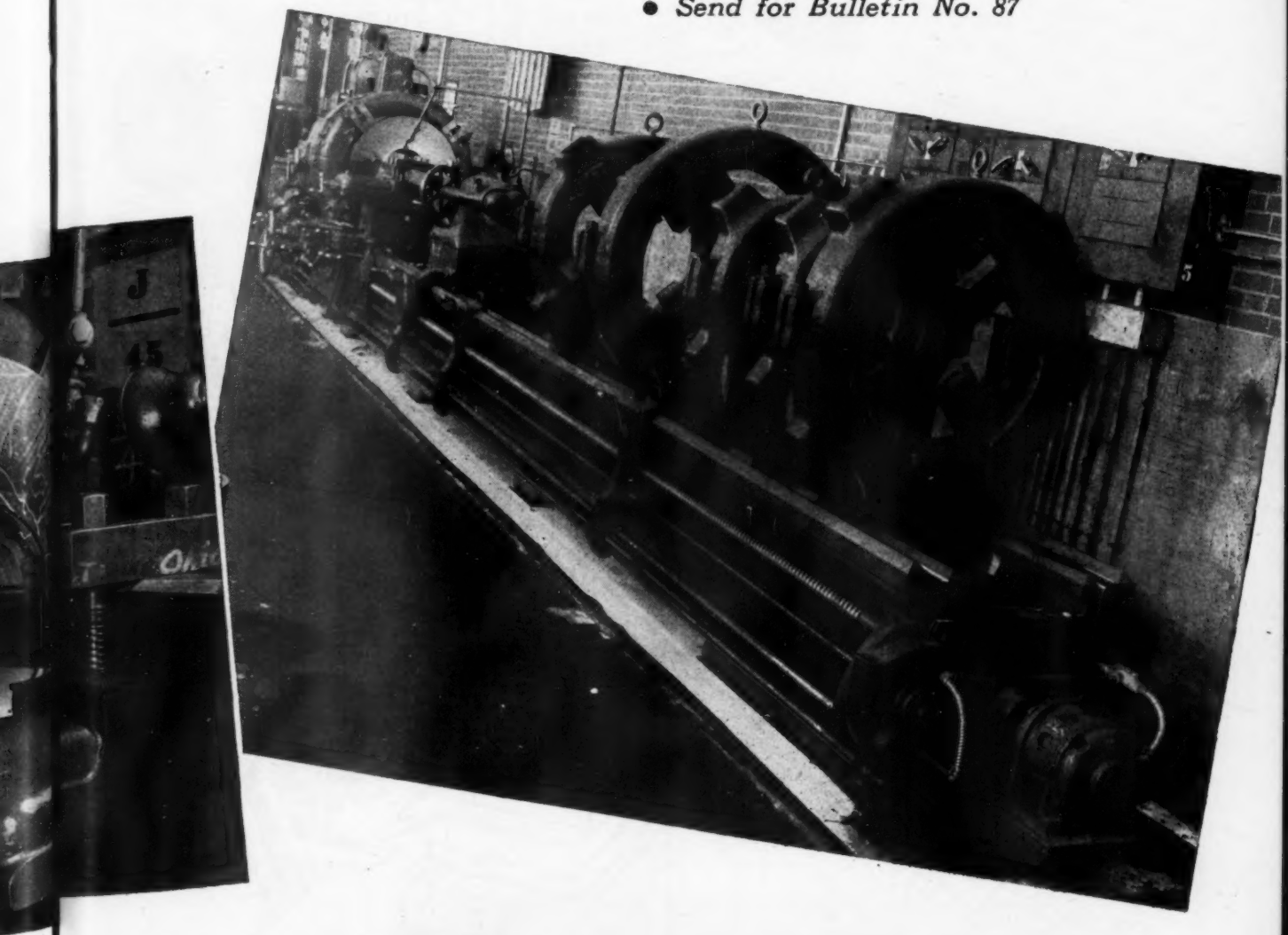
THE AMERICAN TOOL WORKS C

AMERICANS...

"American" Lathes from the smallest to the largest are meeting the challenge of war production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock-schedule. Dependable service, minimum shut-down for failures and repairs coupled with an almost unbelievable ability to "keep going" under any and all conditions are genuine "American" characteristics. "American" Lathes are easy to operate too—another feature that appeals to the operator as does their simplicity of design and complete freedom from complex mechanisms and manipulations.

"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

NORTON *has Complete Service for*

Crystolon Grinding Wheels and Three Types of Diamond Wheels

CUTTING OFF

For cutting carbide blanks into tips and for salvaging broken carbide tools there's the Norton Metal Bonded Diamond Wheel. It's a strong, fast-cutting, long-lived wheel. And because it is very thin, there's minimum waste of carbide. The most popular specification is D120-N100M 1/8 — diameters 3", 4", 5" and 6".

ROUGHING SINGLE-POINT TOOLS

The new improved *Open Structure* Crystolon Wheel is making records in many plants for roughing large single point tools. It cuts faster and cooler and requires less dressing. Stocked in size 14 x 4", 1½" rim, plate mounted, in two specifications 39C60-F12VP and 39C60-G12VP. Also popular is the Norton regular structure Crystolon wheel such as 39C60-17. For backing-off the steel shank there's an Alundum wheel — 38A46-K5VBE.

FINISHING SINGLE-POINT TOOLS

Outstandingly successful for finishinging single-point carbide tools is the new Norton Vitrified Bonded Diamond Wheel with its combination of a fast cutting action plus exceptional resistance to wear and grooving. It is stocked in size 6 x ¾ x ¼" (¾" rim) to fit all 6" carbide tool grinders in specifications D120-N100V 1/16 and D-150-P100V 1/16.

Also available are the Norton fast cutting Resinoid Bonded Diamond Wheel and the durable Metal Bonded.

GRINDING CARBIDE TOOLS

GRINDING CHIP BREAKERS

A fast cutting action is combined with long life and exceptional ability to hold corners in the Norton Vitrified Bonded Diamond Wheel. Available in 4 and 6" diameters, 1/4" thick; suggested specification D150-N100V 1/8. And for grinding narrow grooves, where wheels 1/8" thick are used, Norton hard grade Resinoid Bonded Diamond Wheels are available, such as specification D120-N100B 1/8.

SHARPENING MILLING CUTTERS

For grinding milling cutters, reamers and other multipoint tools Norton has a complete line of Resinoid Bonded Diamond Wheels in shapes and sizes for all types of tool and cutter grinders. Especially popular are the new flaring cup shapes. These are stocked in 3", 3 3/4" and 5" diameters in specifications D150-L100B 1/16.

HONING

For touching up carbide tools on the lathe to prolong the time between regrindings there is the Norton Vitrified Bonded Diamond Hand Hone. It's a fast cutting, wear resistant hone that stays sharp and resists grooving. Popular stock specifications are: single end type D320-V1/16, double end type D220/440V 1/16.

TOOL ROOM

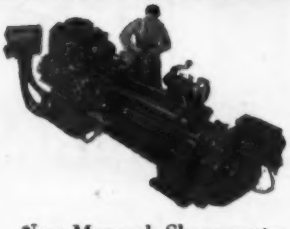
SEE THE NORTON FILM on Carbide Grinding
A Practical, Instructive Motion Picture with Sound and Color

NORTON ABRASIVES

NORTON COMPANY, WORCESTER 6, MASS.

SKILL-

New Monarch 10″ x 20″
Sensitive Precision
Toolmaker's Lathe



New Monarch Shapemaster
with Electric Controls

Monarch 30″x60″
Production Lathe

born of experience is building your

New Monarchs

• The bold daring and ingenuity of our young-in-spirit engineers find their balance wheel in the skilled experience and craftsmanship of the key men of our plant. This combination has produced the present outstanding Monarch turning machines, and will continue to deliver them, better than ever before, for your postwar use.

Already several new improved Monarchs are available as priorities permit. As others come off our production lines, they will have additional engineering features that will set new standards for accuracy, finish and low cost production.

To meet postwar competition you'll need turning machines that will provide more parts per day at lower cost—and thus help to improve our American living standards. Monarchs will do that job.

THE MONARCH MACHINE TOOL CO. • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

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622 W. Washington Blvd.
Phone: Randolph 4295

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

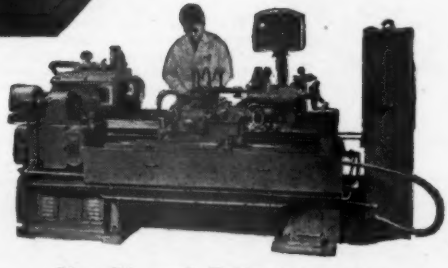
INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

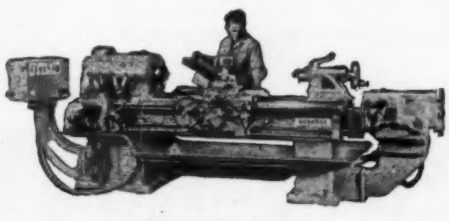
Representatives in Principal Cities

Monarch Saves Time

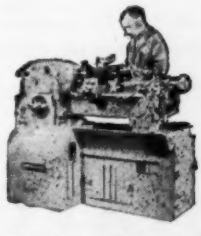
THESE NEW MONARCH MACHINES WILL LOWER YOUR TURNING COSTS



New Monarch Fully Automatic Magnamatic Lathe

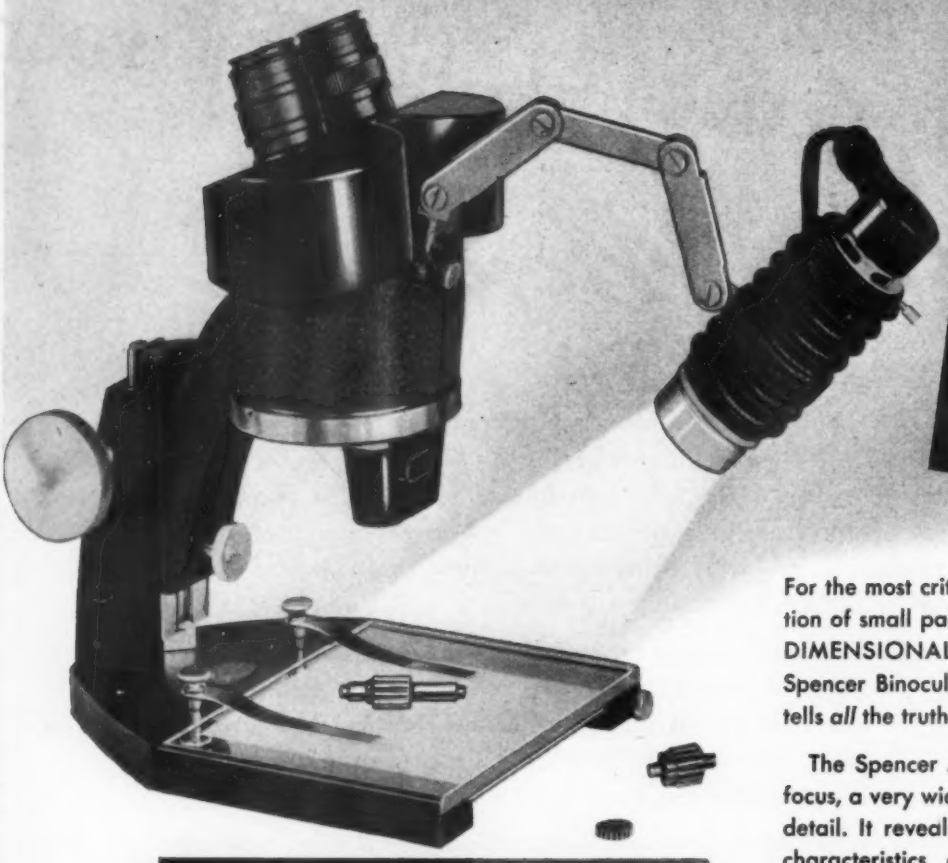


16"x54" Monarch-Keller Lathe



One of 3 types of Monarch's New Hi-Speed Precision Manufacturing Lathes

Aid inspection with "three-dimensional" vision



Another SCHERR speed precision aid

For the most critical inspection at high magnification of small parts, contours, surfaces, use THREE-DIMENSIONAL VISION as provided by the Spencer Binocular Microscope. "Two-eye seeing" tells *all* the truth about an object under inspection.

The Spencer Microscope has unusual depth of focus, a very wide field, and brilliant resolution of detail. It reveals surface scratches, or markings, characteristics of metallurgical structure, and minute imperfections which are beyond the reach of ordinary magnified inspection.

Choice of objectives: .7x, 1x, 2x, 3x, 6x
Choice of eyepieces: 9x, 12x, 15x, 18x
Price, Model 26 with case, $123.50

The Universal Microscope Lamp (shown above) is a valued accessory of the microscope. It throws a concentrated small-area beam of light upon the object. Angle of the light beam can be changed at will to throw into relief any part of the object. Complete, with transformer for 110 V., A.C., $23.50

The SCHERR MAGNI-RAY

For quick 1½ or 3x magnification —
The Scherr Magni-Ray comprises an expertly ground lens (1½x or 3x) in a frame which also contains two tubular lamps. It magnifies and floodlights the object under inspection. Adjustable for angle and height, with solid heavy base. Widely used in inspection work. Details on request.
Price Model A—$18.50

The BORE INSPECTOSCOPE

For highly magnified and illuminated inspection of bores of small firearms and similar work. Gives right-angle or oblique vision of bore surface at any point. Tubes as small as .110" diameter, and as long as 72". Write for details and prices.

SURFACE FINISH STANDARDS

This set of G-E Standards when used with the Spencer Binocular Microscope marks a new step toward uniformity in manufacturing. It establishes and standardizes various degrees of finish, enables the selection of the proper finish for any metal surface, and supplies a comparison standard to check against the finished surface in production. Complete set—includes 10 specimens, each marked in accordance with accompanying reference chart.
Set, $40.00

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

THIS EXCLUSIVE H-P-M PRESS CONTROL PERMITS EASY, INDEPENDENT ADJUSTMENT OF BLANKHOLDER PRESSURES

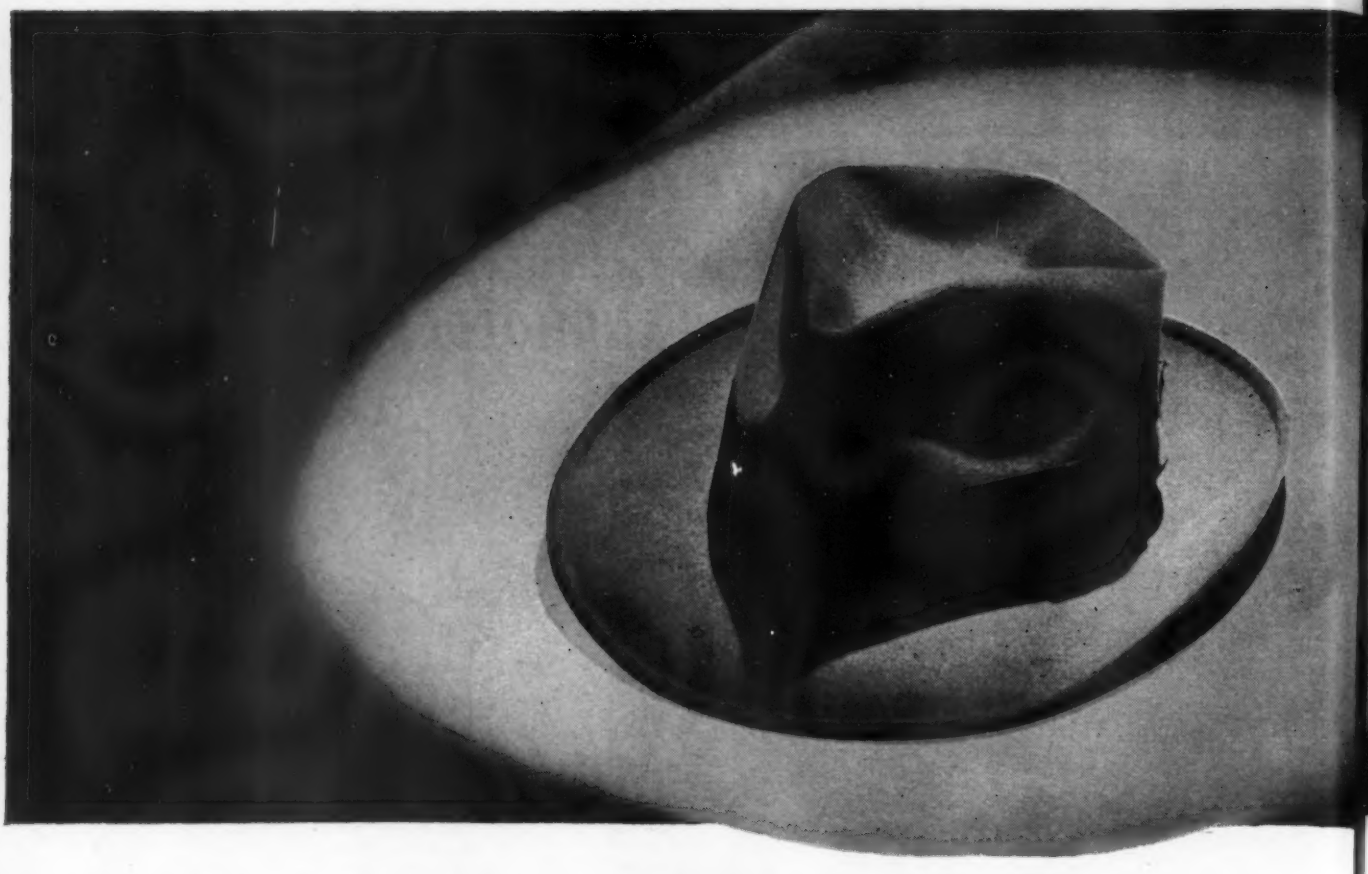
Accurate regulation of the blankholder pressure is a vital factor in drawing sheet metal. To independently adjust the blankholder pressure at each of the four corners of the blankholder slide is an exclusive H-P-M development. It has been found invaluable in drawing parts of irregular contours, where the blank must be held more firmly at certain points than others.

In a convenient panel, at the side of the press, are located the pressure control valves used to independently adjust the force of each blankholder ram. Pressures are accurately indicated on dial type gauges, and can be recorded for future production runs.

Independent adjustment of blankholder pressure at several points is only one of many outstanding features which make the H-P-M FASTRAVERSE press the production standard for sheet metal drawing. Investigate their cost saving features. Write today for details, or better yet, call in an H-P-M press engineer to study your particular metal forming problem.

THE HYDRAULIC PRESS MFG. CO.
MOUNT GILEAD, OHIO, U. S. A.
BRANCH OFFICES – NEW YORK, PHILADELPHIA, CLEVELAND, DETROIT AND CHICAGO
REPRESENTATIVES IN PRINCIPAL CITIES

All-Hydraulic HPM *Self Contained*
FASTRAVERSE PRESSES
for DEEP SHEET METAL DRAWING



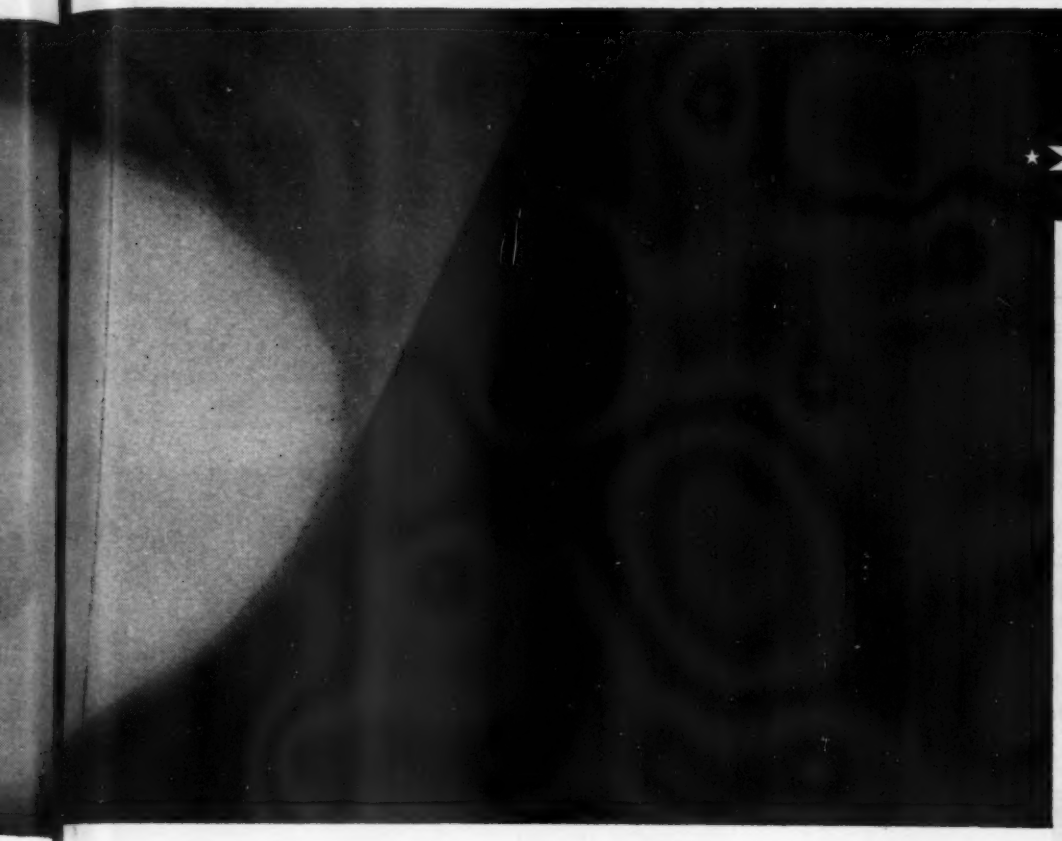
IS YOUR HAT STILL

EX-CELL-O PRECISION MACHINE TOOLS . . . . FOR INCREASED PRODUCTION WITH IMPROVED QUALITY AND REDUCED COST

Ex-Cell-O Style 54 Precision One-way Machine for turning O.D., facing dome end, grooving and chamfering aluminum pistons.

Ex-Cell-O Vertical Drilling Machine for rough and finish drilling five holes in stainless steel exhaust flanges.

EX-CELL-O CORPORATION



XLO

EX-CELL-O *for* PRECISION

IN THE RING?

While doing everything to insure final victory, you can still plan for tomorrow . . . . .

SEE EX-CELL-O FIRST!

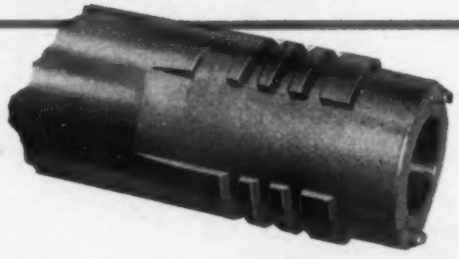
The days immediately ahead will offer you many opportunities for the kind of engineering and production assistance that Ex-Cell-O can give so well. That is why we earnestly recommend that, insofar as is practicable, your planning be started early. Ex-Cell-O's extensive facilities are at your disposal. Write to Ex-Cell-O in Detroit today, or call upon any member of Ex-Cell-O's field engineering staff in 32 leading industrial centers in the United States and Canada.

DETROIT 6, MICHIGAN

- Standard and Special Multiple Way-Type Precision Boring Machines
- Multiple Drilling and Other Special Purpose Machines
- Precision Thread Grinding Machines
- Precision Lapping Machines
- Broaches and Broach Sharpening Machines
- Continental Cutting Tools
- Tool Grinders
- Hydraulic Power Units
- Grinding Spindles
- Drill Jig Bushings
- Fuel Injection Equipment
- R. R. Pins and Bushings
- Pure-Pak Paper Milk Bottle Machines
- Aircraft and Miscellaneous Production Parts

45-50

UNIQUE PRODUCTION PROBLEM SOLVED BY BARBER-COLMAN ENGINEERS...



The breech end of a finished gun barrel 2" outside diameter, showing three lock ring grooves milled on a Barber-Colman Type "A" Hobbing Machine

GUN BARREL LOCK RINGS NOW MILLED ON A HOBBING MACHINE

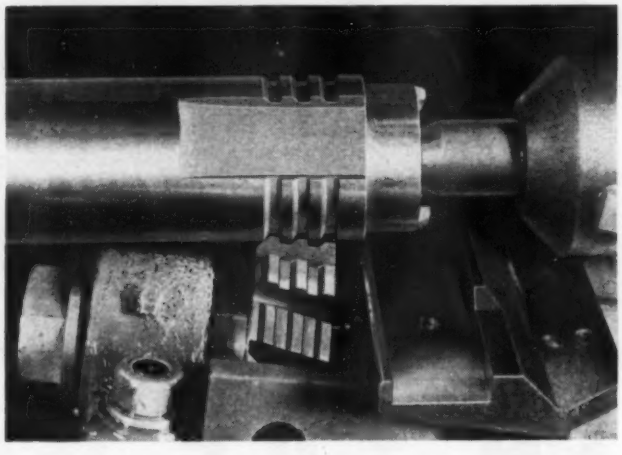
Because certain types of gun barrels must be quickly interchangeable in the field, exacting production methods are demanded to hold machined surfaces to extremely close limits. A problem of this nature, involving the milling of lock rings on the breech end of a gun barrel 2" in diameter was presented to Barber-Colman engineers. These lock rings have one straight side, along with several angular dimensions. It is machining this straight-sided form which makes the job rather difficult.

Type "A" Hobbing Machine milling gun barrel lock rings, showing the 7° tilt on the cutter spindle to produce smooth perpendicular surfaces

This seemingly difficult manufacturing problem was simplified by the application of circular milling on a Barber-Colman Type A Hobbing Machine with special features. A special cutter was designed so that it could be tilted to avoid rubbing in the cut on the straight-sided portion of the form.

Distinctive features of the special tooling and set-up include:

(a) A 90° hob slide with cutter arbor tilted on 7° angle, to compensate for taper form on the cutter.



A close-up of the operation, showing the form of cutter used and its position. The slide on the cutter housing is for locating gage blocks

(b) Special index gears to slow the work rotation and produce approximately .001" chip per tooth of cutter.

(c) A special handwheel provided on feed screw worm gear shaft for convenience in moving hob slide.

(d) Adjustable gage blocks and holder for precisely locating the cutter.

The regular feed gears are not engaged during the operation.

TAPER TYPE CUTTER USED FLOOR-TO-FLOOR TIME, 5 MINUTES

A taper, ground, form-cam-relieved milling cutter, with radii held to ±.001" and pitch held to +.00025"/−.0000", produces 80 to 90 pieces per sharpening. The material is SAE 4150 modified, a tough and stringy steel of 285-320 Brinell. The rings are milled in one cut .111" deep at feed rate of 1¼" per minute and speed of 63 surface feet per minute. The resulting chip load per cutter tooth is approximately .001". Floor-to-floor time is 5 minutes per piece.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

Continued

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
SIMONDS WORDEN WHITE COMPANY

This series of questions and answers is presented as a practical aid in the solution of many of the more common grinding problems. Readers are invited to send in their own grinding questions, without obligation of any sort. All questions will be answered by mail or in this column. No identities will be revealed if published.

18 Q. *"We have a centerless job on a soft steel bar 2" in diameter and 30½" long. We had been using a wheel with a 4" face, 60 grain, medium hardness, and it did a good job. To increase production, we recently switched to a wheel with 8" face, same grain and grade, but we are having trouble with chatter. How can this be remedied?"*

A. As you did not make any mention of the blade, we are of the opinion that you possibly overlooked reducing the top angle of blade when you changed from a 4" to an 8" faced wheel and that this is the probable cause of the chatter. Assuming that the top angle of the blade was about 30 degrees with the 4" faced wheel, it should be no more than 20 to 25 degrees with the 8" face. The reason for this is that the side pressure against the blade increases with the width of the grinding wheel, for quite obviously an 8" faced wheel will exert a much greater pressure against the blade than a wheel with a 4" face. And when this pressure is too great, it tends to squeeze the work up and out of contact with the blade. By reducing the blade angle as suggested, the squeezing pressure is reduced and thus the cause of the chatter is eliminated.

19 Q. *"I enjoy reading your 'Grinding Questions Answered' very much. I have learned something from every series you've published. Do you have Dayton wheels for grinding carbide tipped tools on a bench stand grinder that uses 7" wheels?"*

A. For the roughing operation in grinding carbide tipped tools we recommend our C-60 G-14-V-14 (old marking 960 G-2V). For the finishing operation—C-120 G-14-V-14 (old marking 9120 G-2-V). I hope we may add your name to the long list of shops which now use these wheels.

20 Q. *"On thread grinding jobs when is it best to use a wheel with a vitrified bond? When is it best to use a resinoid bond?"*

A. There are a number of factors which may go to determine the selection of the grinding wheel bond for thread grinding. As a general rule a wheel with a vitrified bond is chosen where close tolerances are required in either the form or lead, for internal grinding, and in the case of worms where several cuts are taken with a light feed.

As for wheels with a resinoid bond, these are generally chosen for high production jobs, i.e., where the parts can be finished with a minimum of cuts, where the work speed is high, and where extremely close tolerances are not required.

21 Q. *"Is it a sign of improperly adjusted work guides when work finishes up with a 'barrel shape' in throughfeed centerless grinding?"*

A. In throughfeed centerless grinding, "barrel shaped" work can be caused by both the front guides and the rear guides being deflected towards the regulating wheel—or the latter may have a convex face.

22 Q. *"Are the stones in diamond dressing and truing tools always the same in respect to quality and shape?"*

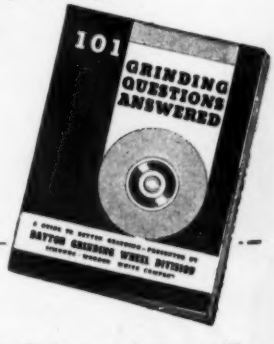
A. No, diamonds in dressing and truing tools differ in both type and shape according to the use which is made of them. For small external wheels of fine grain and hard grade, ¼ to 1¼ carat octahedron shaped Brazilian stones are usually employed. For softer wheels octahedron shaped grey or brown stones can be used. Smaller grey and brown stones—⅛ to ¾ carat—with long natural points, are used for small internal wheels. Wheels used for thread and hob grinding call for stones that are long with natural points or sharp splinters. Gear grinding wheels demand the finest and most carefully selected brown or Brazilian octahedron shaped stones.

23 Q. *"After a wheel has once been balanced on a precision job, what is the technical reason for re-balancing it as its diameter wears smaller?"*

A. Although the modern grinding wheel is a precision tool and in the light of present knowledge is as "near-perfect" as we know how to make it, there are points of unequal density in all wheels. Because of this, a wheel may get out-of-balance as it wears down. Hence, the necessity for re-balancing it as its diameter becomes smaller.

READY NOW...a guide to better grinding!

101 "Answers" to everyday grinding problems—indexed for quick, easy reference—will be sent FREE to anyone interested in better grinding practices. Just fill in and mail coupon below.
SIMONDS WORDEN WHITE CO., DAYTON 7, OHIO.



DAYTON GRINDING WHEELS

SIMONDS WORDEN WHITE CO.,
712 Negley Place, Dayton 7, Ohio

Please send me Free Booklet "101 Grinding Questions Answered"

Name_____

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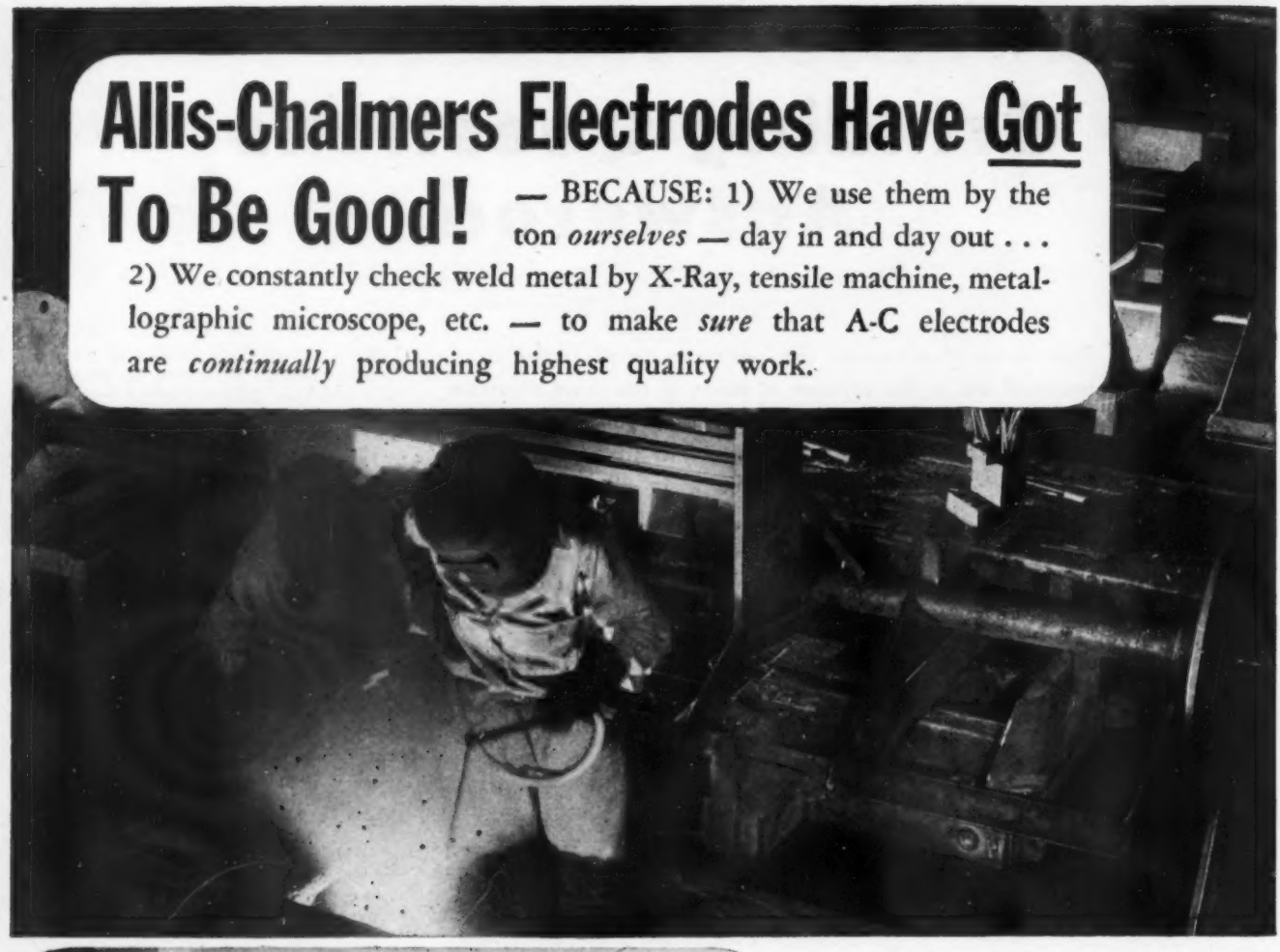
City_____ Zone_____ State_____

Allis-Chalmers Electrodes Have Got To Be Good!

— BECAUSE: 1) We use them by the ton *ourselves* — day in and day out . . . 2) We constantly check weld metal by X-Ray, tensile machine, metallographic microscope, etc. — to make *sure* that A-C electrodes are *continually* producing highest quality work.



1 Allis-Chalmers supplies to industry the world's greatest variety of capital goods—over 1600 types of products. Skilled workmanship by thousands of welding operators plays an important part in that record. And *tons* of Allis-Chalmers electrodes are used every day—in such A-C shops as above—to turn out this massive production. Since A-C's *own* weld production hinges on the uniform quality of these electrodes you can see that *they've got to be good!*

2 One of the typical tests Allis-Chalmers sample welds undergo is inspection on this metallographic microscope. Minute details can be enlarged up to 12,000 diameters—enabling *accurate* study of weld metal structure. With the constant aid of modern research equipment such as this, Allis-Chalmers makes *sure* that A-C electrodes are *made* right—and *perform* right. Try them on *your* next welding job. Our nearby district office or welder dealer can supply you.

A 1810

ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A-C Electrodes
EASY TO REMEMBER
EASY TO BUY
Sold by AWS Number

HEADQUARTERS FOR WELDING EQUIPMENT

AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ARC WELDING ACCESSORIES

HARDINGE

High Speed Precision

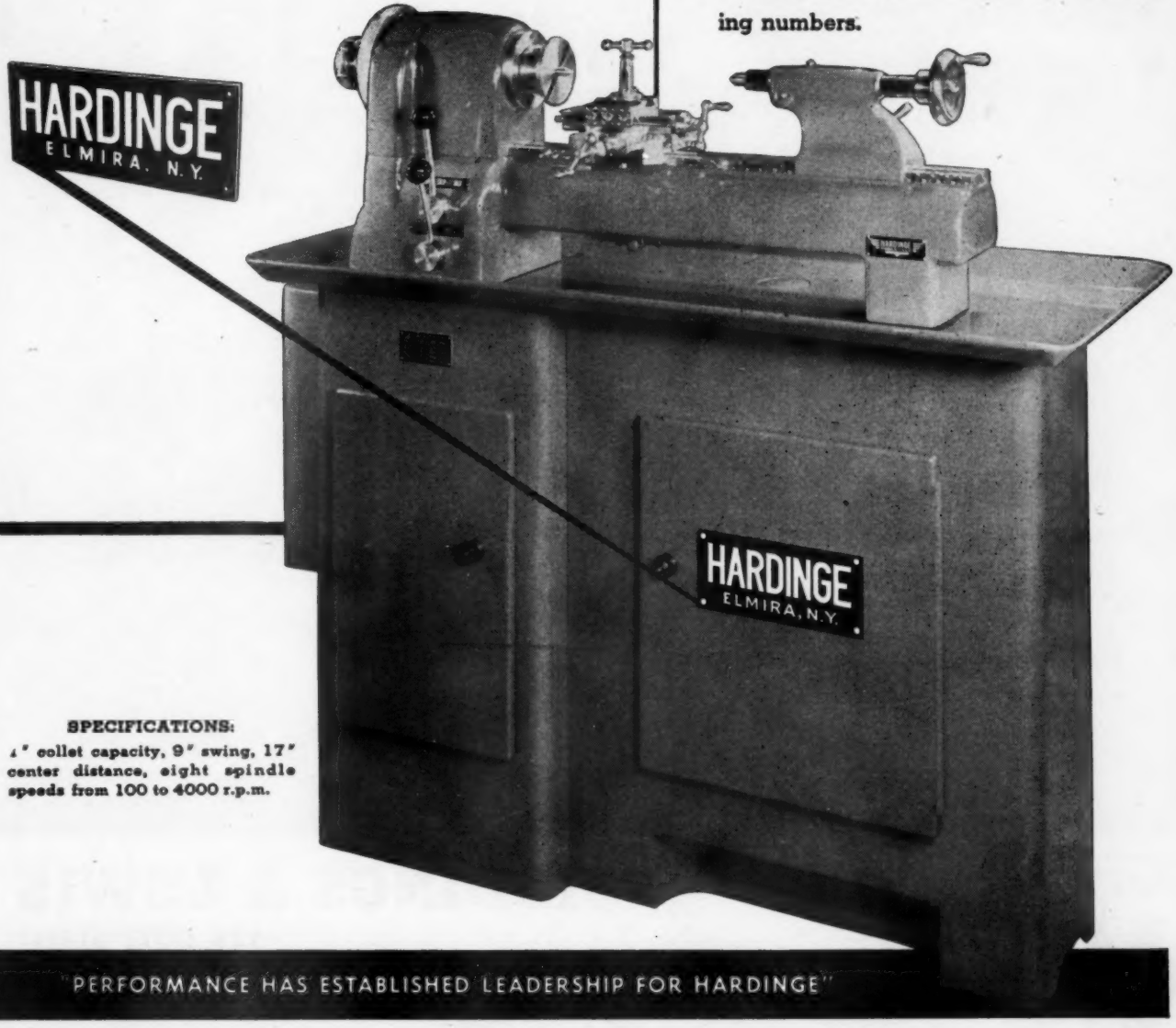
LATHE

is designed for accurate tool room work

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever increasing numbers.



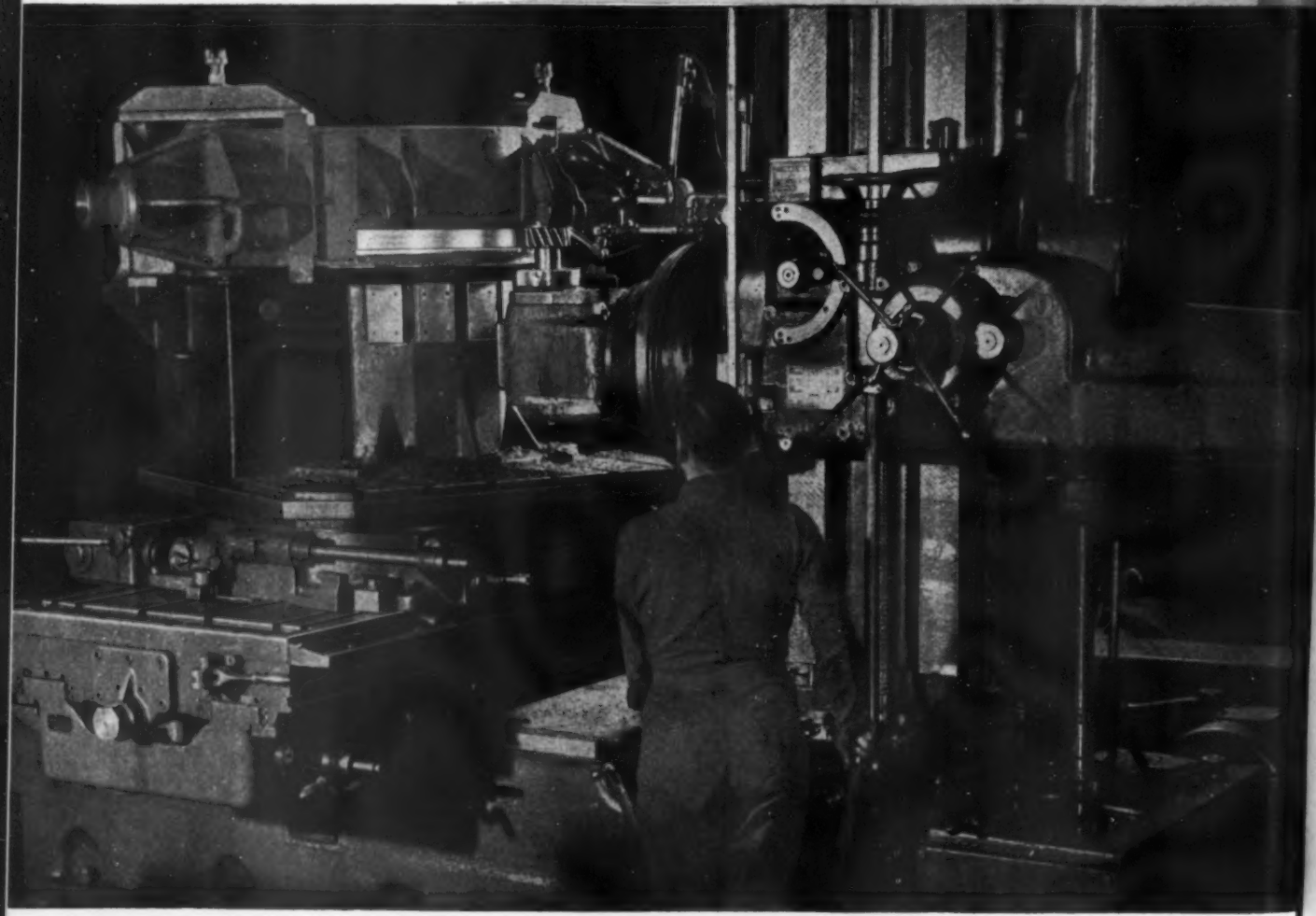
SPECIFICATIONS:
4" collet capacity, 9" swing, 17" center distance, eight spindle speeds from 100 to 4000 r.p.m.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

HERE'S THE *simple* WAY TO COMPLETE 7 *difficult* RADIUS MACHINING OPERATIONS!

G. & L. Horizontal Boring Machine showing bowitzer bottom carriage, holding fixture, power driven rotary table and angular milling attachment.

Power Table on G. & L. Machine Rotates Work While Right Angle Attachment Makes Milling Cuts...



G&L

GIDDINGS & LEWIS

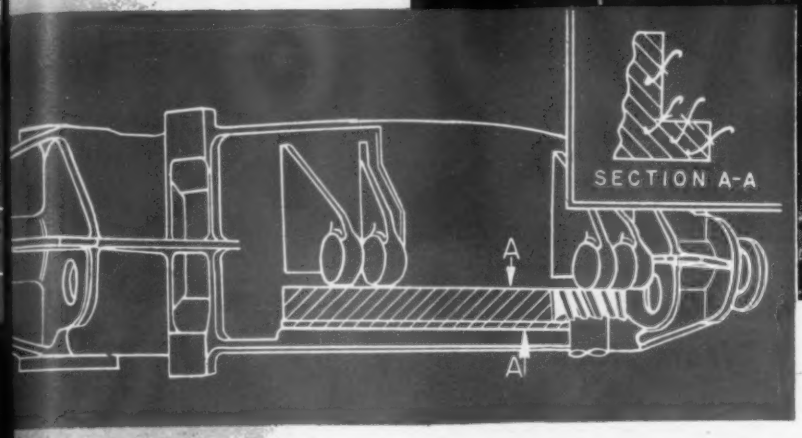
138 DOTY STREET

Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

(Right) Close-up view showing radius milling operation. Note position of radius being machined and how clearance is obtained by positioning angular milling attachment.

(Below) Outline drawing of bottom carriage with radius machining indicated.



Machining a difficult radial bearing surface on this howitzer bottom carriage is efficiently handled on a *standard* G. & L. Horizontal Boring Machine with *standard* time-saving G. & L. Attachments. A study of the work being done shows it is impractical to perform these operations on any other type equipment because of the location of the surfaces to be machined in respect to interfering brackets and other projections.

Seven radius machining cuts are required: these include rough and finish radius ledge cuts; rough, semi-finish and finish radius cuts; one chamfer and one slotting clearance cut.

HOW RADIUS CUTS ARE MADE

A G. & L. angular milling attachment, driven by the machine spindle, is positioned with the cutter up. This gives the needed clearance for the workpiece to rotate on a G. & L. power driven rotary table. As the part turns, the milling cutter of the angular attachment makes its cut. The rotation of the table gives the required radius. A special fixture mounted on the rotary table is used to hold the work.

FLEXIBILITY OF STANDARD G. & L. MACHINES AND ATTACHMENTS

This excellent example shows how a difficult machining problem was solved with standard G. & L. equipment. You may need similar machine flexibility to produce your work. Consult Giddings & Lewis engineers who will advise you how to produce more parts at less cost on the G. & L. Horizontal Boring, Drilling and Milling Machines.

Additional Data

. . . complete information available on Giddings & Lewis machines, accessories and time-saving attachments. Write for Bulletin No. AM-55 today. Please indicate your business connection.

MACHINE TOOL CO.

FOND DU LAC, WIS.

Left: G. & L. Planer Type Machine.

Left: G. & L. Multiple Head Type Machine

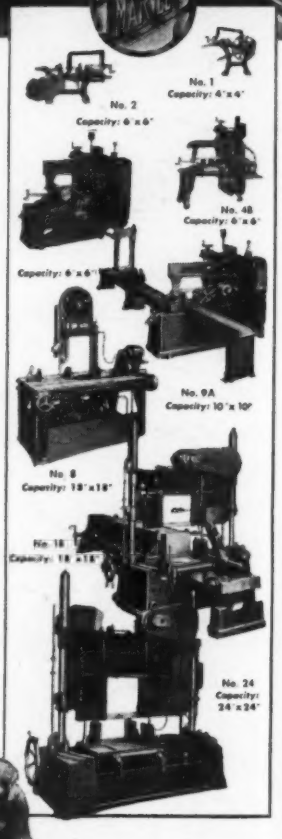
NOW CRUCIBLE STEEL WAREHOUSES DELIVER

—any size, any length "from stock"

With their modern high speed MARVEL Hack Saws the Crucible Steel Company's Warehouses can deliver orders "from stock," whether for a few miscellaneous lengths, a thousand alloy steel gear blanks, a single tool steel disc 18 inches in diameter, or other lengths or slices accurately cut-off from any type bar stock.

In their Indianapolis quick service Warehouse shown above they have two No. 9A MARVEL Automatic Bar Feed Sawing Machines (capacity 10" x 10") and one No. 18 MARVEL Universal Roll Stroke Hydraulic Saw (capacity 18" x 18"). The high speed 9A will cut-off identical pieces from single or nested bars automatically with no more operator attention that an automatic screw machine requires. They can be stopped at any point in a quantity run; a miscellaneous cut made; and the quantity run resumed by simply disengaging and reengaging the automatic feed. The No. 18 "Roll Stroke" Hydraulic Saw handles the heavy stuff—will quickly cut-off the largest and toughest bars.

The Crucible Steel Company, like many others, have found the MARVEL Hack Saw method fast, accurate and economical; and that it requires no special skill on the part of the operator.

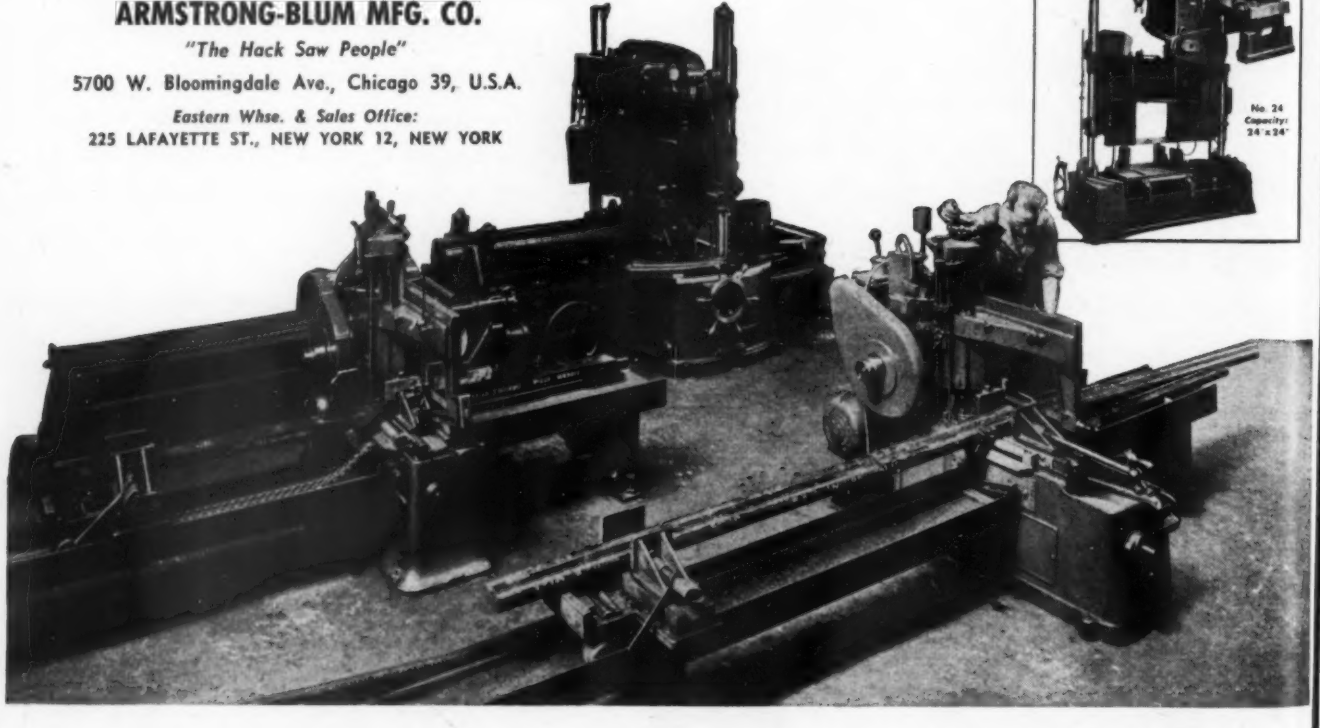


ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave., Chicago 39, U.S.A.

Eastern Whse. & Sales Office:
225 LAFAYETTE ST., NEW YORK 12, NEW YORK



Then, considering the large quantity, early delivery and precision required, we all agree ... It's a job for Aeronautical Products » »

WHERE ordinary thinking stops, Aeronautical Products' engineers begin. Where normal precision techniques leave off, Aeronautical Products' exceptional machining methods take over. It's only natural, then, that our mammoth capacity, engineering genius and creative skill developed long before the war and now devoted to total war output, will give us continued Leadership in the peacetime production of precision parts for every purpose. . . . Here in one organization with two great plants, is the *complete* precision parts picture . . . from creative engineering through all phases of manufacturing. So if you, too, are looking ahead, now would be a good time to solve your peacetime parts problem. Our Executive Sales Office will gladly mail you interesting facts on our plant facilities and equipment. Chances are, we have the answer you're searching for!

★ BUY WAR BONDS ★

● *Make ownership of a safe, sturdy Aeronautical Products Helicopter a "must" in your personal postwar plan. You'll find you can afford one!*

AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT
and Administrative Offices:
18100 Ryan Road, Detroit 12

OHIO PLANT:
Washington Court House
Ohio

★For your small hole drilling work requiring high production and precision on holes up to 1¼ inch diameter you can depend on a FOSDICK High Speed Drill.

First because of its simplicity both in construction and operation. All operating controls including spindle speed changes are conveniently located for operator in normal working position. 6 to 9 spindle speeds are instantly available with single speed motor, 12 to 18 spindle speeds with a two speed motor.

These high speed drills may be furnished in single or multiple spindles up to six and with either hand feed—power feed—or tapping attachment.

Fosdick High Speed Drills have gained a wide acceptance in hundreds of shops for their high productive capacity and precision work. Illustrated is a single spindle type drilling small parts in a tool and die shop. The use of simple fixtures often enables operator to drill several holes of different diameter at one loading of the fixture.

Investigate the Fosdick High Speed Drill —for speed — accuracy and ultimate economy. *Write for Fosdick High Speed Bulletin HSA for complete details of construction and operation.*

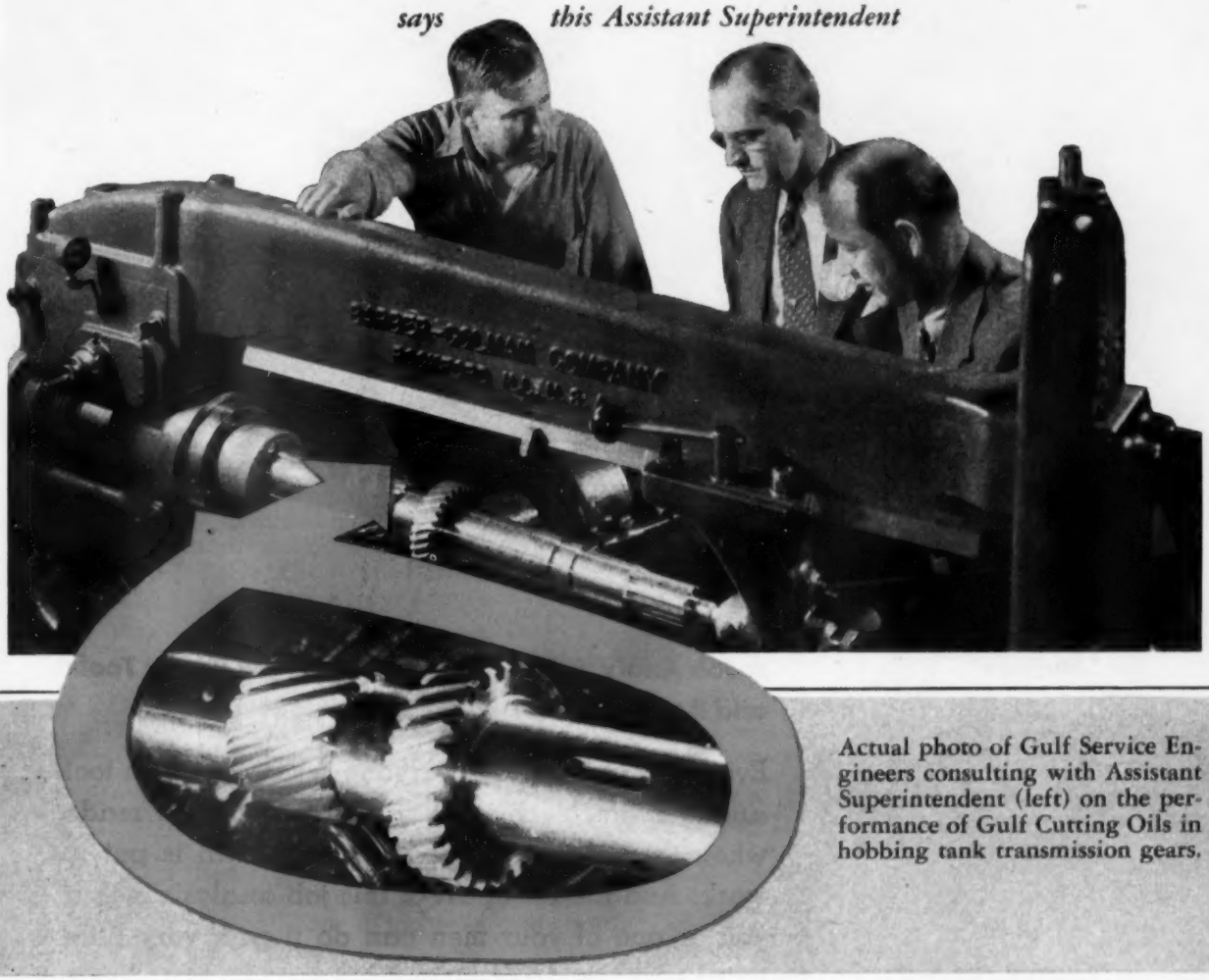
FOSDICK
high speed drills will solve your small hole drilling problems.

ARMY E NAVY

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

"WITH GULF CUTTING OILS WE GET LONGER TOOL LIFE, BETTER FINISHES"—

says this Assistant Superintendent



Actual photo of Gulf Service Engineers consulting with Assistant Superintendent (left) on the performance of Gulf Cutting Oils in hobbing tank transmission gears.

WITH GULF CUTTING OILS, finish on hobbed gears has been so improved that it is almost equal to that obtained in the final shaving operation," says this Assistant Superintendent. "We also get much longer tool life."

This is one of hundreds of war plants that have improved finish and tool life on precision work by using the proper Gulf Cutting Oil for each particular job requirement.

Gulf performance-proven cutting oils have established records on the toughest steels and most punishing schedules that the armament and aircraft industries offer. You'll find them helpful in improving production now and in reducing costs in the postwar period.

Let a Gulf Service Engineer show you why Gulf Cutting Oils are ideal for many of your machining jobs. Write, wire, or phone your nearest Gulf office today.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation—Gulf Refining Company
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a 45-page Machining Guide.

Company_____

Name_____

Title_____

Address_____

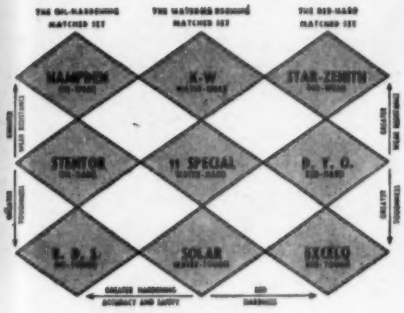
. . . WHAT ARE YOUR TOOLS and DIES DOING TO YOUR PRODUCTION COSTS?

A Job Analysis NOW will help you get Better Tools and Reduce Costs!

Even in plants where everyone is satisfied with tool and die life, surprising improvements are made when the Carpenter *job analysis plan* is put to work. And the best part of this job analysis is that you or one of your men can do it with very little extra effort and get—

- **Better Heat Treating Results**
- **More Pieces Between Grinds**
- **Less Machine Down Time**
- **Lower Tool Costs**
- **Lower Production Costs**

The Standard Tool Steels of Industry



This 3-Step Job Analysis Plan Gives You BETTER Tools and LOWER Unit Costs!

1. The Way to Match Tool Steel to the Job . . .

Suppose you are hunting for *greater toughness,* more *wear resistance* or greater *hardening accuracy* in a tool. With the Carpenter Matched Set Method you can eliminate the guesswork that comes up when you must select from dozens of tool steels. The nine Carpenter Matched Tool Steels shown on this diagram will solve 90% of the problems that come up in your tool room.

And here's the best part of this method of job analysis. With the diagram and the Carpenter *Matched Tool Steel Manual* you can actually predetermine tool performance on each job. The Manual contains an 80-page Tool Index and Steel Selector that quickly points to the best starting place on the diagram when you have a tool to make. The Manual is free to tool steel users in the U. S. A., so for your copy, just drop us a note on your company letterhead.

2. How to Get Better Hardening Results . . .

The second step in your analysis of each job is a check-up on heat treating methods. For proper heat treatment improves hardening results and reduces tooling costs. It also protects your tool design and steel selection recommendations.

The new Carpenter Heat Treating Guide can help you check your heat treating methods to get more from the tool steel you use. It is a slide chart that quickly gives your heat treaters this important information about each Matched Tool Steel: forging heat, normalizing heat, annealing treatment, hardening treatment and recommended drawing range. It also contains tips on quenching, furnace atmospheres, etc. This Guide is free to tool steel users in the U. S. A., so send for your copy.

3. And Now to Reduce Unit Costs . . .

Check on tool life and output per grind! Every time a tool setup has to be torn down, every time a tool has to be made over, costs shoot up. By using the Carpenter Matched Set Method, following recommended heat treating procedures and keeping a close check on the results—you can nip high costs in the bud.

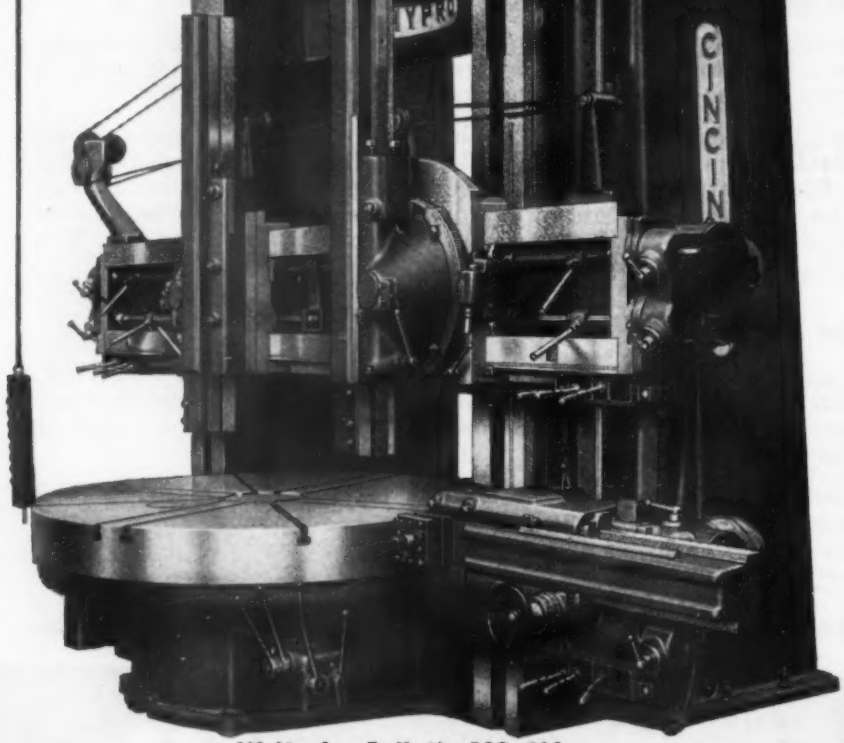
And for personal help with your tool steel job analysis program, call your Carpenter representative. He has the kind of engineering experience that can help you answer the question: "What are my tools and dies doing to production costs?"

The Carpenter Steel Company • 109 W. Bern St., Reading, Penna.

Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

CINCINNATI HYPRO *7' Vertical* BORING MILL



Write for Bulletin 132-AM

For Capacity Versatility Accuracy

Specify Cincinnati Hypro Vertical Boring and Turning Mills.

The 7' Mill shown brings you these advantages:

One-piece bed and speed box, reinforced with heavy radial ribs to eliminate misalignment.

Extra depth table heavily reinforced with radial ribs and driven by a wide face spiral bevel gear that is nearly the full diameter of the table.

The table runs on anti-friction bearings.

A fully Timkenized speed box, built into the one-piece bed, offers 16 speeds on alternating current or wide range, fine increment speed adjustment with a direct current main drive motor.

Massive pyramid type housings provide for rigidity under the most severe duty.

Quick acting, self-interlocking rail clamp may be operated from either end of the extra heavy rail.

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.

Have you seen the new day coming?

Even in the pre-dawn darkness of war there are signs that it is on the way. . . . It *can* be the greatest day the world has ever known.

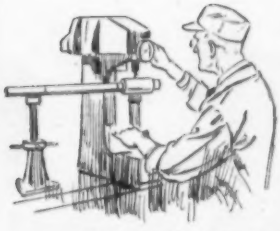
Already men, materials and American ideals have penetrated to the last wildernesses of the earth. There's a trans-Atlantic flight every 13 minutes of the day and night . . . 160,000 miles of air routes being flown by American transport planes . . . our air strength is double that of the rest of the world combined . . . our manufacturing productivity half of the world's total capacity. We have what it takes to *force* prosperity and to *enforce* peace.

We at Bryant feel that we're part of the new day that's coming. Our record in war links us with great production achievements, from the millionths-of-an-inch precision in the modern airplane engine to the millions of things that we'll help to produce more simply, faster, for less. We urge you to call us in now!

BRYANT CHUCKING GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

Testing Saddle Cross Slide Dovetail for Squareness with Lathe Bed Ways.

PRECISION IS *Built In* IN SOUTH BEND LATHES



Testing the Hardness of a Carburized Headstock Spindle Bearing Surface.

Checking a Fixture with Precision Gauges.

Inspecting Form and Lead of a Screw Thread with an Optical Comparator.

The "built-in" precision of South Bend Lathes, so evident in their performance, has its source not only in their design features, but in every vital part. Each part has behind it the experience of thirty-eight years of lathe building, plus constant research directed towards its improvement. Backing this up in every manufacturing process are rigid controls that prevent deviations from established standards. These are a few of the reasons why South Bend Lathes are better today in every way.

This "built-in" precision makes possible heavier cuts and feeds, easier operation, longer life, and greater accuracy. It pays dividends to the users of these lathes in better and faster machining. Examine your metal working requirements in view of the advantages that can be obtained through the use of South Bend Lathes.

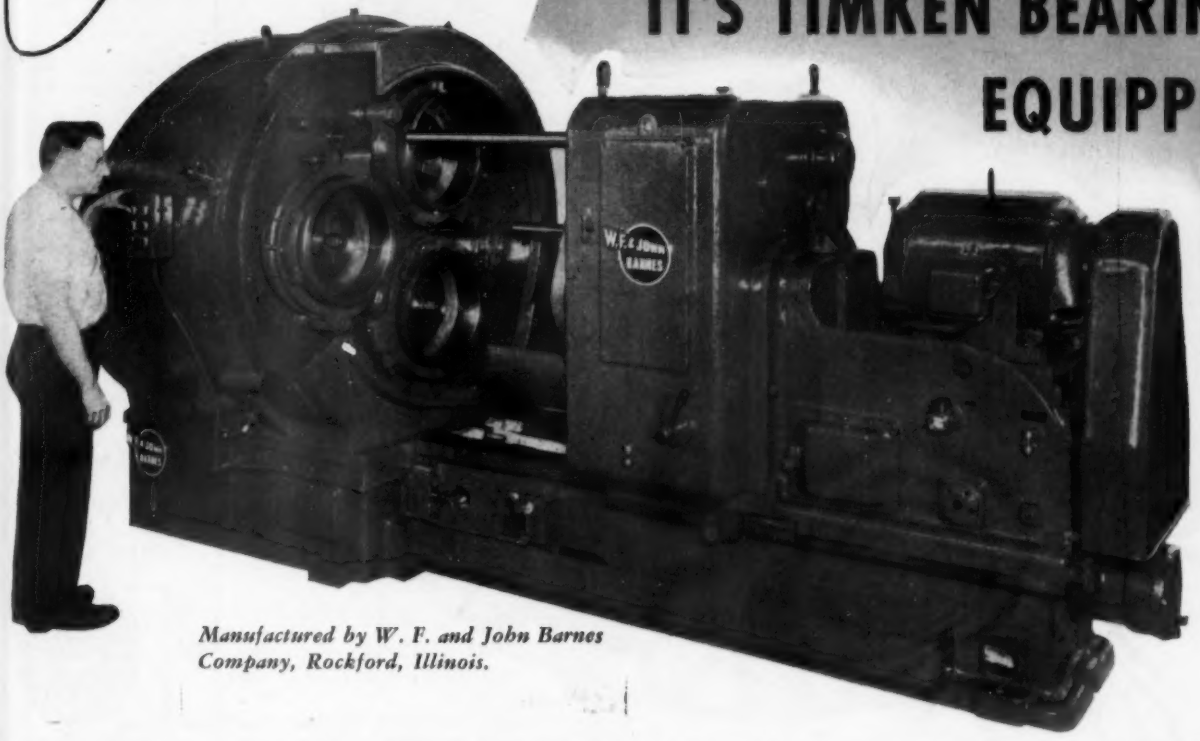
Write for
NEW LATHE CATALOG 100-D

Illustrates and describes all South Bend Lathes. Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Precision Turret Lathes with ½" and 1" collet capacities.

SOUTH BEND LATHE WORKS
419 EAST MADISON STREET • SOUTH BEND 22, INDIANA
LATHE BUILDERS FOR 38 YEARS

Precision? the finest

IT'S TIMKEN BEARING EQUIPPED



Manufactured by W. F. and John Barnes Company, Rockford, Illinois.

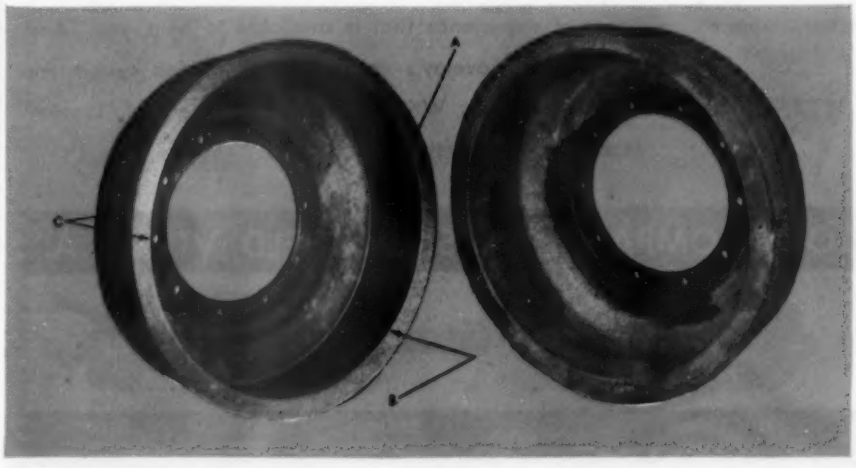
Precision is a product of precision in Timken Bearing Equipped machine tools, for the Timken Tapered Roller Bearing is one of the most scientifically designed and most finely constructed mechanisms the world has ever known.

Timken Bearings hold machine tool spindles constantly rigid and true in the face of all and any operating conditions. Be tool pressures what they may; thrust loads of extreme severity; tolerances ever so close; spindles turning on Timken Bearings can be depended upon for consistently accurate, uniform, enduring and economical performance.

The Barnes Heavy-duty Single-end Trunnion Machine shown in the photograph has a two-spindle heavy-duty type boring head for stub boring operations, the flange-type spindles being equipped with Timken Bearings.

This equipment machines heavy-duty brake drums performing three operations on each drum, namely, surface (A) rough bore; surface (B) chamfer; surface (C) turn diameter and face surface.

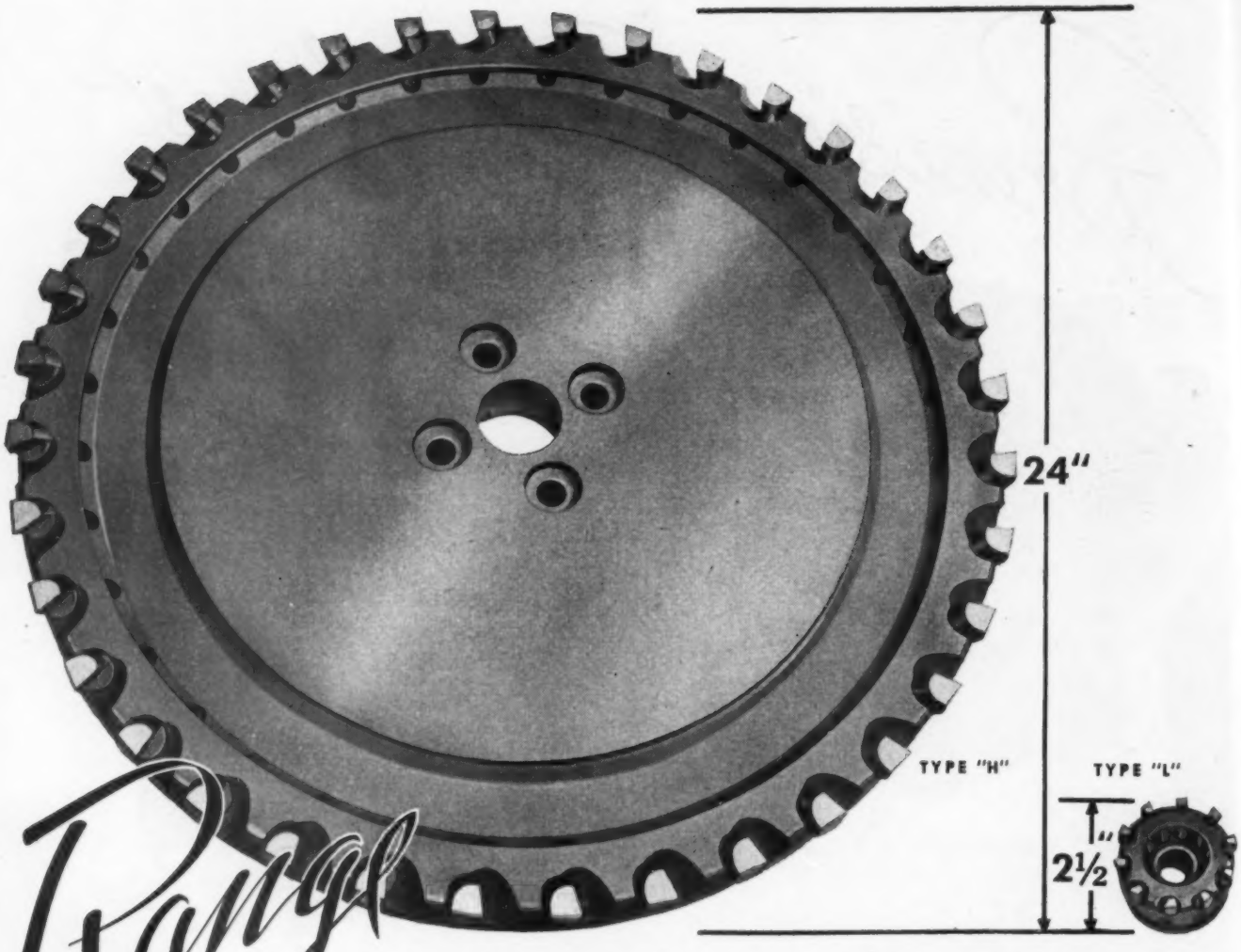
Be sure you have Timken Bearings in the machines you manufacture or buy. Look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



Range TO MEET PRACTICALLY ANY MILLING JOB ...WILL BE FOUND IN THE LOVEJOY LINE

From the tiny Type "L" cutter to the giant Type "H", you will find a range of Lovejoy *positive-locking* Milling Cutters to meet practically every production requirement. And every one uses *standard* Lovejoy blades that are available *from stock.*

All the standard types and sizes are illustrated in the new Lovejoy catalog. Here you will find detailed descriptions of the cost-cutting features found in all Lovejoy inserted-tooth type tools. Here you will find tips on cutting, grinding, speeds, feeds, etc. Use the handy coupon for your copy — there is no obligation.

If your work requires special cutters, call on Lovejoy for special designs — we have a background of nearly 30 years of experience that is available to help you. And don't forget Lovejoy's coast-to-coast service system for on-the-spot help. Write for your free copy of "Lovejoy Modern Metal Cutting Tools".

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A new aluminum alloy, R-303, is claimed to be non-corrosive and to have twice the compressive strength of structural steel. *Reynolds Metals Co.*

get ready with CONE for tomorrow

A method has been announced for transmitting television programs over ordinary telephone lines, instead of coaxial cables or air relays, and for the recording of television in a manner comparable to the recording of radio. *Packard Mfg. Co.*

get ready with CONE for tomorrow

The fuel being used in the B-29's over Japan is said to have an octane rating well over 130. *Aero Digest.*

get ready with CONE for tomorrow

This year's models of one make of highway bus have rubber springs. *Twin Coach.*

get ready with CONE for tomorrow

A newly installed turbine generator, in a city power station, has twice the capacity of the 14 previously installed units combined. *Fisk Station, Chicago.*

get ready with CONE for tomorrow

One of our new aircraft engines weighs only 0.97 pounds per horse power. *Wright Cyclone 9.*

get ready with CONE for tomorrow

The first American-built steam turbine locomotive is being given a service test. *Baldwin Locomotive Works, Penna. R. R.*

get ready with CONE for tomorrow

Army aircraft are being "jacked up" when on soft ground by inflating large rubber pillows placed under the wings. *Science News Letter.*

get ready with CONE for tomorrow

A manufacturer of aluminum utensils is planning to make aluminum kitchen furniture. *Aluminum Cooking Utensils Company.*

White or light colored vitreous enamels can now be applied directly to steel surfaces. *Inland Steel Company.*

get ready with CONE for tomorrow

A company has been established to process three-dimensional photographs (vectographs) in quantity for civilians. *Three Dimension Company.*

get ready with CONE for tomorrow

A new processed wood called "Staypak" has been developed that is claimed to be twice as tough as "Compreg". *U. S. Forest Products Lab., Madison, Wisconsin.*

get ready with CONE for tomorrow

In one city a system of radiotelephone communications between a central station and public or private vehicles is expected to be in operation by next fall. *Pittsburgh.*

An airport bus, designed to connect small towns with main airlines, has a ticket office, flight control tower, freight space, lunch counter, two-way radio, telephone and washroom, as well as seating space for passengers. *Parks Air Transport East St. Louis.*

get ready with CONE for tomorrow

Reports say that one of our largest automobile manufacturers is planning an entirely new 5-cylinder car to sell at about 20% below the lowest prewar level. *Ford.*

get ready with CONE for tomorrow

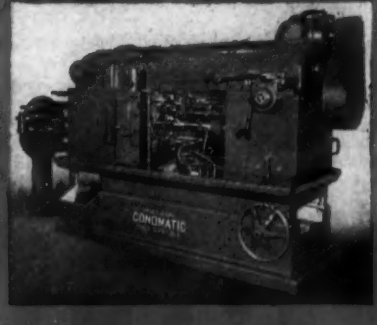
A new process so reduces the cost of making gasoline from natural gas that a large refinery is being planned for this purpose. *M. W. Kellog, Jersey City.*

get ready with CONE for tomorrow

30 to 50 ton trucks as long as 75 feet have been built and are now being put to specialized uses, such as the hauling of ore, aircraft and prefabricated houses. *Scientific American.*

for tomorrow's competition

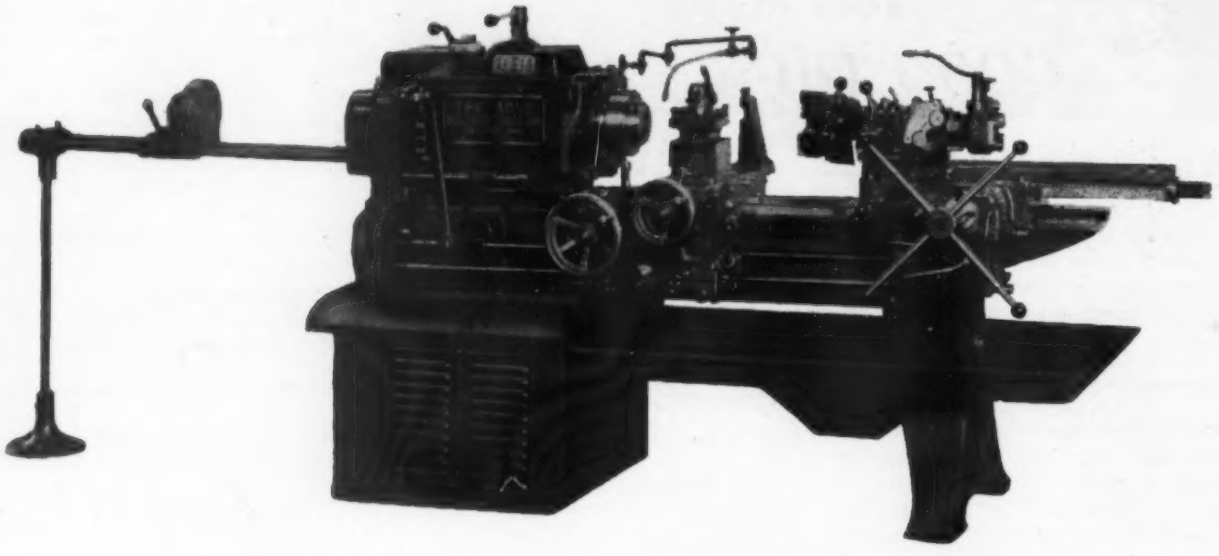
Sixteen tools on an 8-spindle Conomatic complete this part in 23 seconds — including the small hole on the end.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

18



ACME

RAM TYPE FOR BAR WORK

● This Acme Ram Type Turret Lathe is fitted with Automatic Chuck and screw bar feed. It is also equipped with chasing attachment for cutting from 4 to 32 threads per inch. This attachment is extra and furnished only when required.

This type machine will accommodate round bar stock up to 2" on the No. 5R machine, and up to 2½" round stock on the No. 6R machine.

All of the most important features necessary to maintain accuracy and speed at low cost are incorporated in this design which includes:

Hardened steel vees on bed.
Hardened steel ram slide bearings.
Triple roller spindle bearings.
Twin nut back lash eliminator on cross screw.
Non-overhanging headstock.
Side carriage apron taper gibed to front bearing on bed.
Independent feed ranges for either apron.

These are only a few of the many features.

For further details, or if you have any problems on bar or chucking work, feel free to contact us.

The ACME MACHINE TOOL CO.
... CINCINNATI 32, OHIO.

FASTER SPEEDS HEAVIER FEEDS ... THE ORDER OF THE DAY

CTW

CONTINENTAL TOOL WORKS

EX-CELL-O CORPORATION

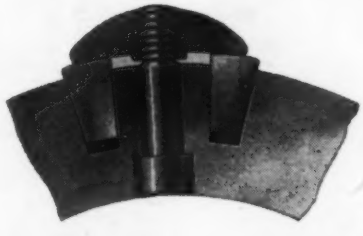
Continental CUTTING TOOLS

- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45-59

Continental Type "R" Face Milling Cutters Have Many Superior Features

. . . for positive or negative rake milling . . . with removable blades (carbide-tipped, high speed steel, or cast alloy) . . . rugged body construction with simple yet ingenious positive blade lock that utilizes amplified forces . . . has advantage of blade adjustment into infinite increments . . . no special tools required to re-set blades . . . Continental Cutter can be readily modified to suit varying operating conditions. Wide range of sizes.



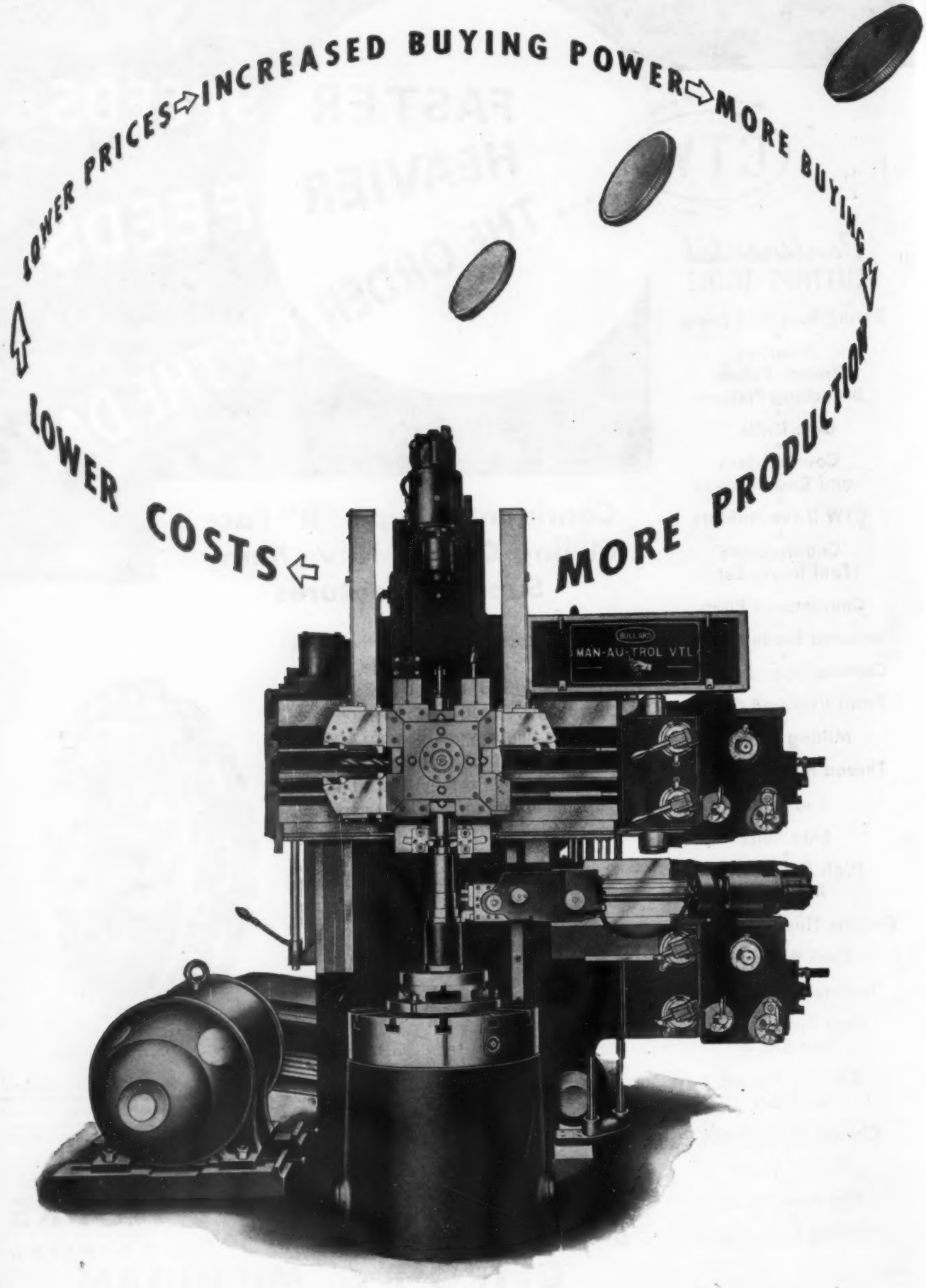
Note simplicity of Continental clamp, each clamp securely locking two blades. Ample clearance at the bottom of each slot insures perfect seat for blades.

Continental Cutter body is hardened to prevent mutilation and wear. There are no screw threads in the cutter body to wear out, strip, or become plugged with broken screws. Send for Bulletin M-338.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN


LOWER PRICES
INCREASED BUYING POWER
MORE BUYING
MORE PRODUCTION
LOWER COSTS
BULLARD
MAN-AU-TROL VTL

The Wheel of Business Fortune

Business prospers when the cycle of making-and-selling-and-buying turns more and more rapidly.

Making more products makes each one cost less. Lowering prices lets more people buy. More buying means that production must be increased . . . employment increased . . . *profits* increased.

The question, today, is — where, on the wheel, do we apply the pressure to make it turn?

At "More Buying"? Where is the money coming from — government handout?

At "Lower Prices"? Who is going to take the loss — wages and profits?

At "More Production"? *That* is the American way — the way that *has worked*, and will work again . . . to lower costs, widen markets, improve standards of living, provide jobs, give business a greater return on investment.

• • •

Confidence . . . confidence enough in the well-proved principles of mass production to invest in machinery for making better goods cost less . . . is the essential ingredient for postwar prosperity.

As revolutionary today as the Bullard Mult-Au-Matic Method was some 30 years ago at the inception of mass production, is the new Bullard MAN-AU-TROL principle of automaticity. This new principle combines, for the first time in machine tool history, the high-speed production of special-purpose machinery with the all-purpose versatility of manually-operated machines. With it you can provide — at the right point — the impulse that will make *your* wheel of fortune move.

BULLARD'S NEW MAN-AU-TROL VERTICAL TURRET LATHE LOWERS PRODUCTION COSTS SIX WAYS

1. **Helps Manpower Do More:** Makes the operator supervisor of the machine. The best production methods, predetermined, are set into automatic cycles, with the operator supervising production.

2. **Cuts Machining Time:** Does the job in a fraction of the time required with manually-operated machines.

3. **Makes Automaticity Versatile:** Machines, automatically, any and all pieces that the Vertical Turret Lathe can turn out under manual operation, but faster and better.

4. **Saves Time:** Requires fewer tools for the same operations, and the automatic control can be set to predetermine speeds, feeds, direction, length and limit of all cuts in their proper sequence, in little more time than previously required for the cycle of each piece under manual operation.

5. **Eliminates Human Error:** Machines repeatedly to a degree of accuracy no man can match in constant production. Reduces discards, scrap work and salvage.

6. **Gives the Machine a Broader Purpose:** Is instantly available for either automatic or manual operation as production requirements dictate.

For complete information about the new Bullard MAN-AU-TROL Vertical Turret Lathe, write for Booklet A. The Bullard Company, Bridgeport 2, Connecticut.

BULLARD
MAN-AU-TROL
MASTERS OF THE MACHINE

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

NORBIDE*

Increases Gage Life 100 Times!

NORBIDE*--the hardest material made by man . . . resists abrasion and scratching . . . will not pick up lint nor become charged with metal particles . . . lighter than aluminum . . . outwears conventional measuring devices 100 times and more.

NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

*Reg. Trade-mark

Aluminum

MEETS THESE REQUIREMENTS for electronic equipment:

Light weight **with sturdiness is necessary, whether the device is carried in a plane or by ground troops.**

Corrosion resistance **provided by Alcoa Aluminum Alloys assures greater dependability under battle conditions.**

Electrical properties **of aluminum—high conductivity, nonmagnetic, nonsparking—suit it for electronic purposes.**

Electroplating

IMPROVES ALUMINUM'S NATURAL ADVANTAGES:

Silver plating, **for example, gives higher surface conductivity for high frequency currents employed electronically.**

Soldered assemblies **are possible where surfaces to be joined have been plated.**

Successful plating **on a production basis is an accomplished fact. "Careful control, knowing how, and strict adherence to formulae", are the rules laid down.**

Perhaps you can help

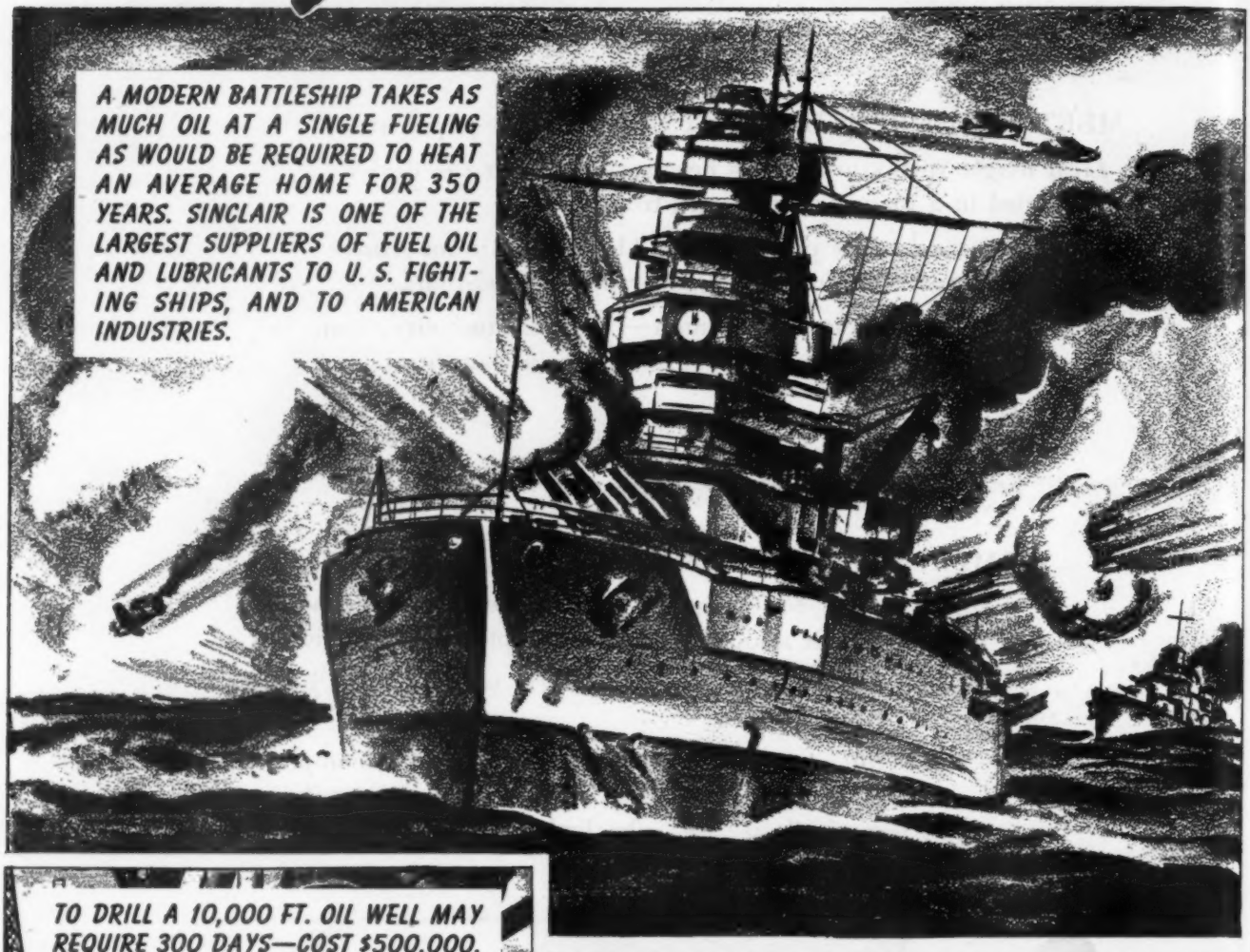
Additional facilities **are needed to increase the production on plating operations. Agencies in charge of procurement say they will welcome the assistance of other companies in boosting output of wartime electronic equipment.**

Alcoa offers you **basic information on plating aluminum which will let you adapt the processes to your plant. If interested, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pa.**

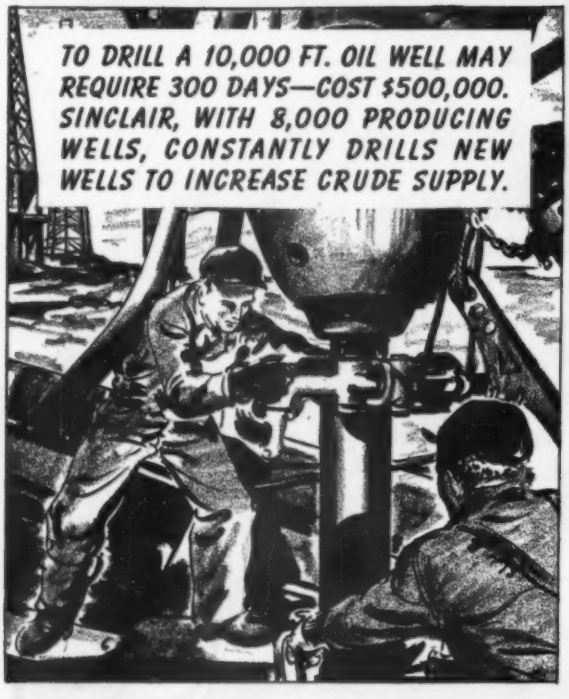
ALCOA

ALCOA FIRST IN ALUMINUM

Do you know that . . .



A MODERN BATTLESHIP TAKES AS MUCH OIL AT A SINGLE FUELING AS WOULD BE REQUIRED TO HEAT AN AVERAGE HOME FOR 350 YEARS. SINCLAIR IS ONE OF THE LARGEST SUPPLIERS OF FUEL OIL AND LUBRICANTS TO U. S. FIGHTING SHIPS, AND TO AMERICAN INDUSTRIES.



TO DRILL A 10,000 FT. OIL WELL MAY REQUIRE 300 DAYS—COST $500,000. SINCLAIR, WITH 8,000 PRODUCING WELLS, CONSTANTLY DRILLS NEW WELLS TO INCREASE CRUDE SUPPLY.

SINCLAIR GENERAL PURPOSE LUBRICANTS AND CUTTING OILS ECONOMICALLY MEET ALL SHOP REQUIREMENTS . . . PROMOTE BETTER MAINTENANCE OF EQUIPMENT, FASTER MACHINING, HIGHER PRECISION, FINER FINISH.

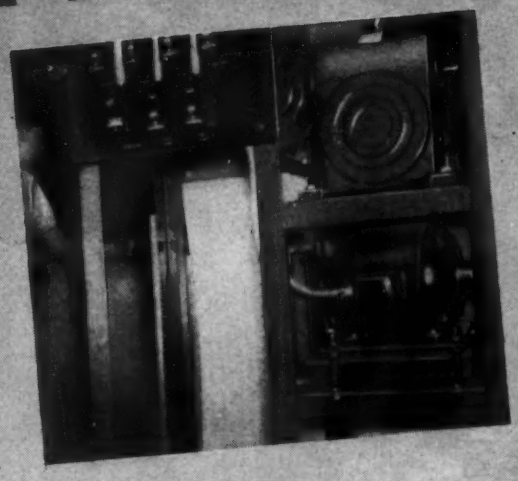
SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

IN STUFFY SPOTS

Many a motor must be located where walls, adjacent equipment, or materials cut down the free flow of air. Sometimes, as in the case of this wool-dryer drive, surroundings are hot, and stuffy, too.

Tri-Clad motors have proved themselves cool-running even under such conditions. Their powerful, double-end ventilating system moves the air at controlled velocity for effective heat removal. The location and baffling of dual exhaust ports discourage recirculation.



Tri-Clad motor drives conveyor on wool dryer—Bigelow Sanford Carpet Co., Amsterdam, N. Y.

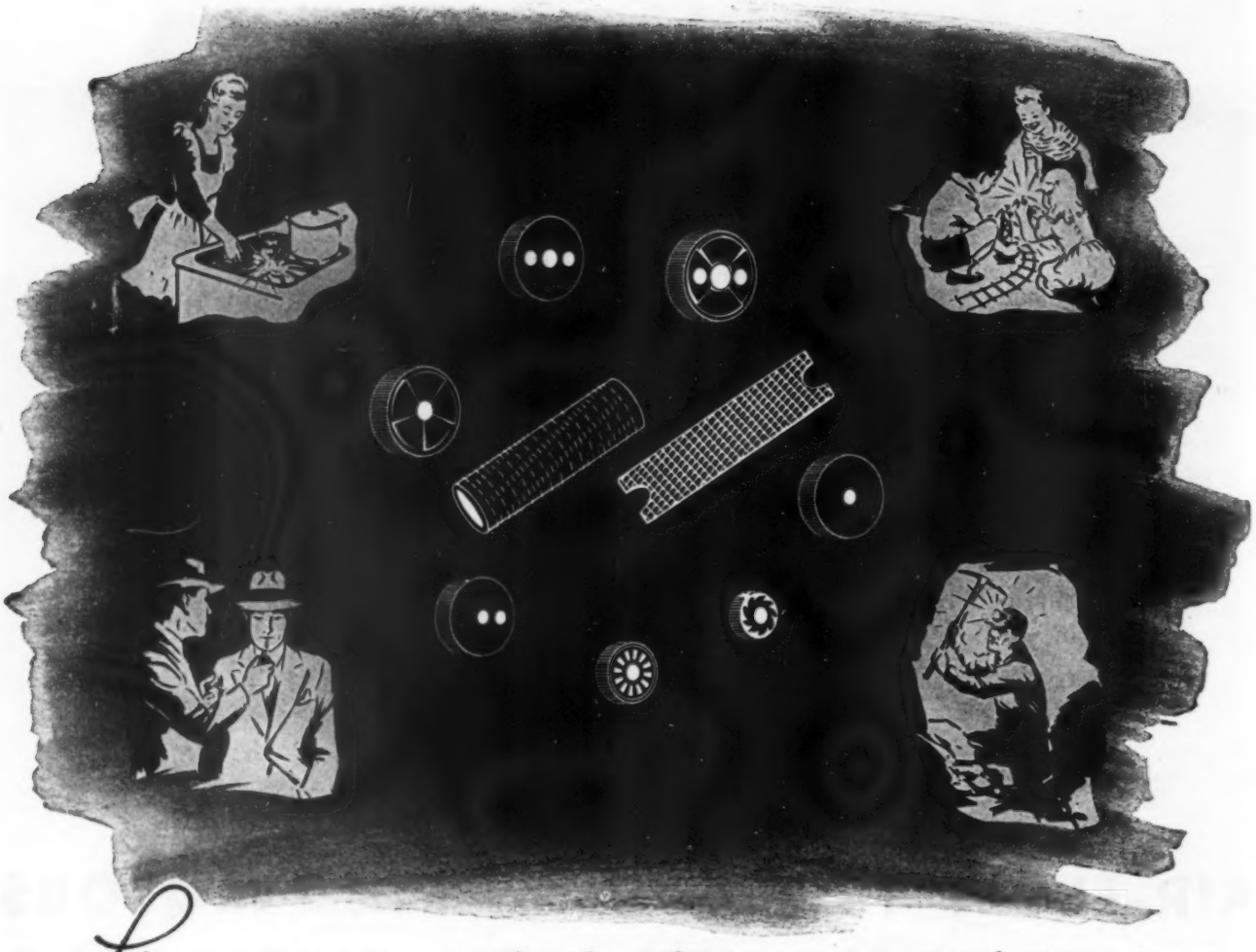
AIR-FLOW TESTS OF TRI-CLAD MOTORS LEAD TO PROTECTION FROM OVERHEATING

Plenum chamber test of Tri-Clad motor ventilation at G-E motor factory.

Before new types or sizes of Tri-Clad motors are approved for production, plenum chamber tests are conducted on the ventilating systems of sample models. These measurements serve as a check on previous calculations of the volume and velocity of air through the motor under different conditions. Other tests under load within enclosures and at abnormal ambient temperatures are also made. If your motors must be confined in stuffy spots, G.E. can help you make the right choice to beat the heat. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

Buy all the BONDS you can—*and keep all you buy*



There is no satisfactory substitute for

BUCHMANN SPARK WHEELS

. . . IN THE WORLD'S FINEST SPARKING DEVICES

For 33 years the universal standard of quality for all sparking devices, BUCHMANN SPARK WHEELS are available in stock sizes or made to your exact specifications for all manual and automatic sparking devices.

. . . IN YOUR POST-WAR PRODUCTS

Buchmann manufacturing facilities, greatly expanded to meet the needs of wartime, are today engaged wholly in essential production.

But if you plan to manufacture cigarette lighters, gas lighters, mining lamps, sparking toys or other sparking devices, Buchmann Spark Wheel Corporation will gladly share the practical knowledge gained by 33 years of experience in this specialized field. As the world's largest manufacturer of spark wheels, Buchmann Spark Wheel Corporation gives your products the advantage of *recognized top quality in any price bracket*—a factor of first importance in the competitive years ahead.

ARMY (E) NAVY

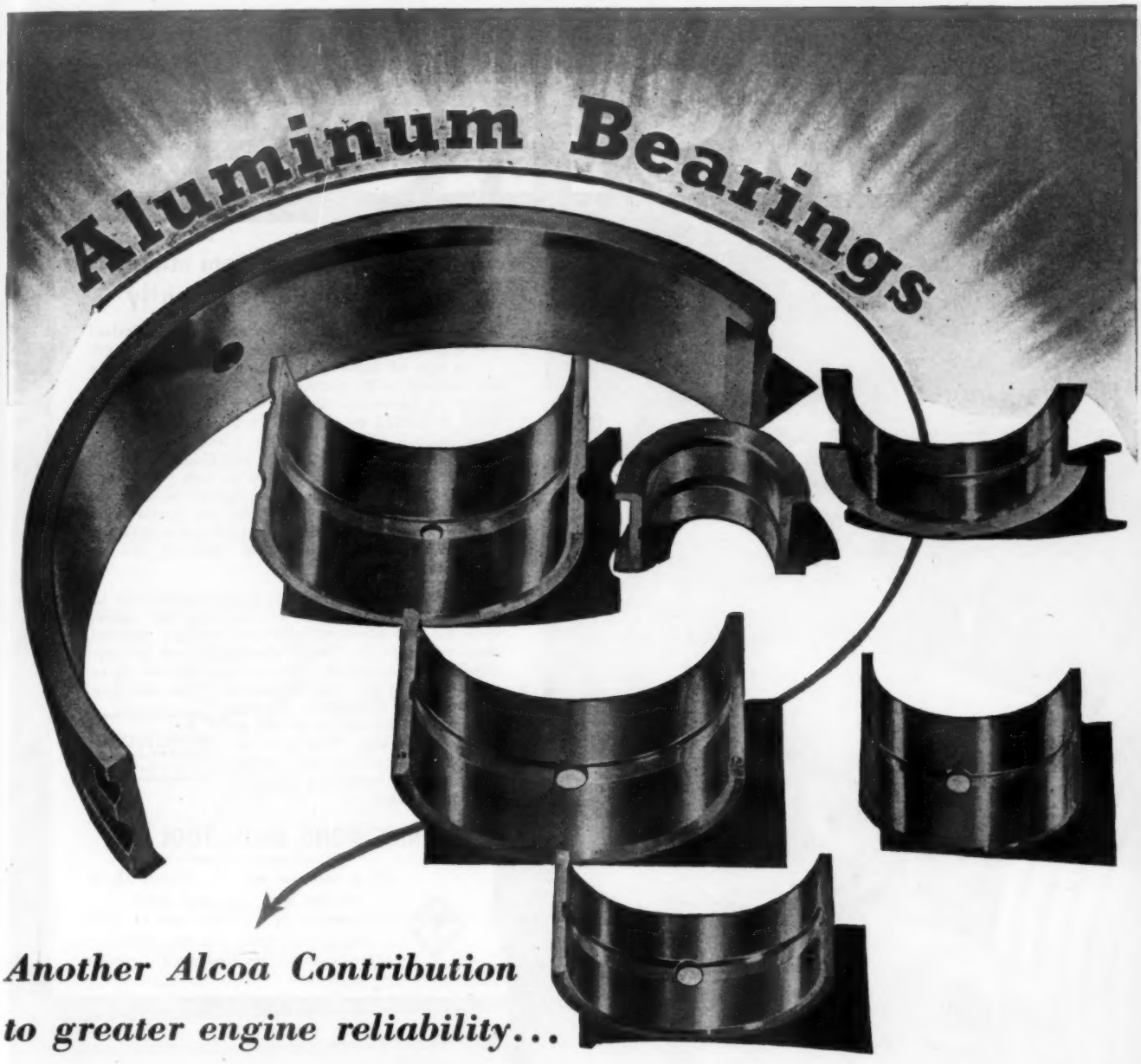
PRECISION SCREW MACHINE PRODUCTS

Buchmann also manufactures special screw machine products and can assist you in the design and production of parts requiring machining to close tolerances. Inquiries are invited.

There is no satisfactory substitute for precision

BUCHMANN SPARK WHEEL CORPORATION, 4-20 47th Avenue, Long Island City 1, New York

Aluminum Bearings



Another Alcoa Contribution to greater engine reliability...

You can safely operate Alcoa Aluminum bearings at higher loads. This is a proved fact—proved repeatedly under scientific control on the test floor and under the varied circumstances of severe routine service.

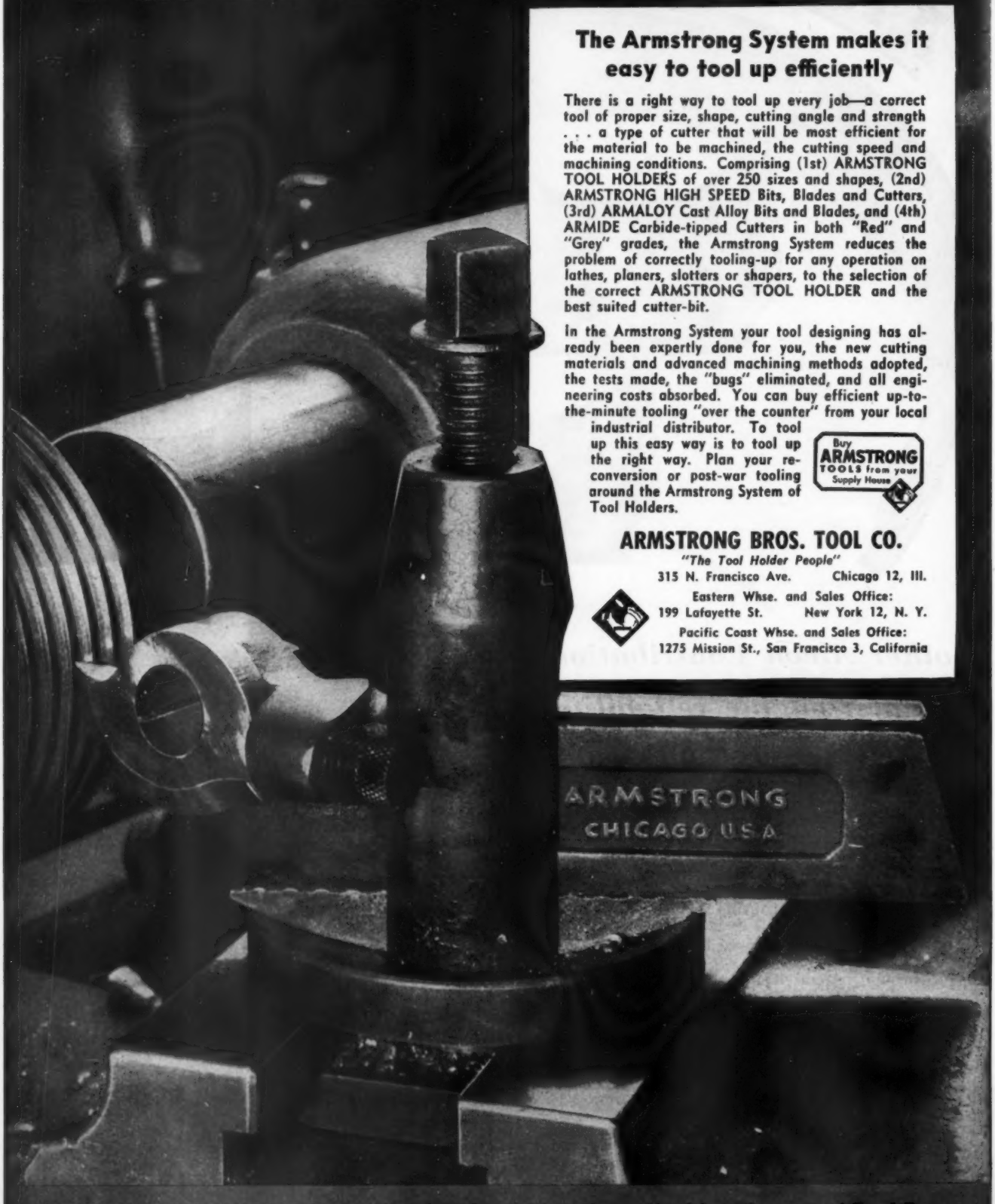
These bearings are bearing metal clear through. Alcoa bearing alloys offer excellent bearing characteristics. Their high heat conductivity lowers surface temperatures.

Don't be surprised when an engine builder gives you this evidence of a big step forward—"We're using Alcoa Aluminum bearings for better performance and greater reliability." A number of manufacturers have standardized on them for their heavy-duty work. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

ARMSTRONG



The Armstrong System makes it easy to tool up efficiently

There is a right way to tool up every job—a correct tool of proper size, shape, cutting angle and strength . . . a type of cutter that will be most efficient for the material to be machined, the cutting speed and machining conditions. Comprising (1st) ARMSTRONG TOOL HOLDERS of over 250 sizes and shapes, (2nd) ARMSTRONG HIGH SPEED Bits, Blades and Cutters, (3rd) ARMALOY Cast Alloy Bits and Blades, and (4th) ARMIDE Carbide-tipped Cutters in both "Red" and "Grey" grades, the Armstrong System reduces the problem of correctly tooling-up for any operation on lathes, planers, slotters or shapers, to the selection of the correct ARMSTRONG TOOL HOLDER and the best suited cutter-bit.

In the Armstrong System your tool designing has already been expertly done for you, the new cutting materials and advanced machining methods adopted, the tests made, the "bugs" eliminated, and all engineering costs absorbed. You can buy efficient up-to-the-minute tooling "over the counter" from your local industrial distributor. To tool up this easy way is to tool up the right way. Plan your re-conversion or post-war tooling around the Armstrong System of Tool Holders.

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG BROS. TOOL CO.

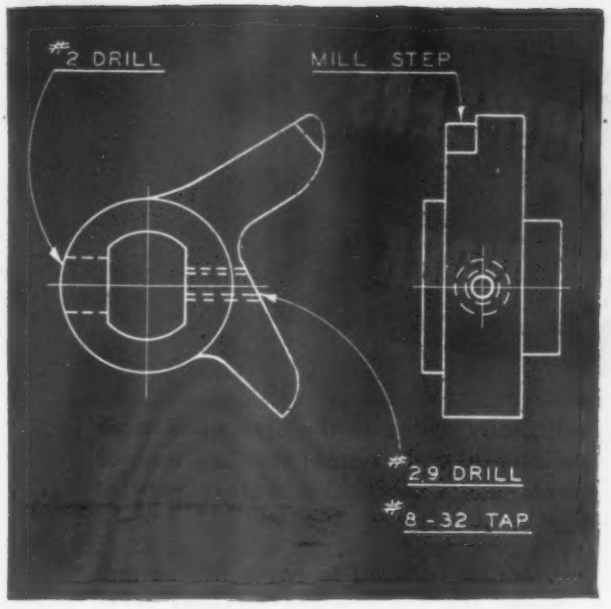
"The Tool Holder People"

315 N. Francisco Ave. Chicago 12, Ill.

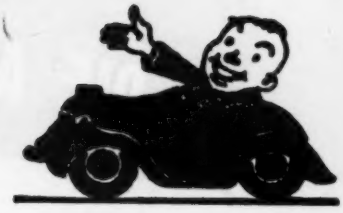
Eastern Whse. and Sales Office:
199 Lafayette St. New York 12, N. Y.

Pacific Coast Whse. and Sales Office:
1275 Mission St., San Francisco 3, California

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



THIS IS A FLEXIMATIC AUTOMOTIVE JOB!



FLEXIMATIC

by KINGSBURY

Flexible, Automatic, and Fast . . . !

Even such a small part as an automobile door latch presents an opportunity for savings when a Kingsbury FLEXIMATIC is used to produce them. The machine illustrated performs four operations—drilling two holes, tapping and milling—finishing these brass forgings at unbelievably high speeds. And, in adding to the ease and economy of FLEXIMATIC operation is the fact that this machine doesn't even have to be unloaded! The operator merely loads the work and clamps it. It is automatically unclamped and ejected.

Kingsbury FLEXIMATICS are made up of standard units for drilling, milling, tapping, etc. — as many as necessary — mounted in any position on one of several types of standard bases. This Kingsbury method of standardizing the various units of assembly results in a machine that can easily be changed to meet changes in design and production . . . a FLEXIBLE, an AUTOMATIC, a FAST production machine.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U.S.A.

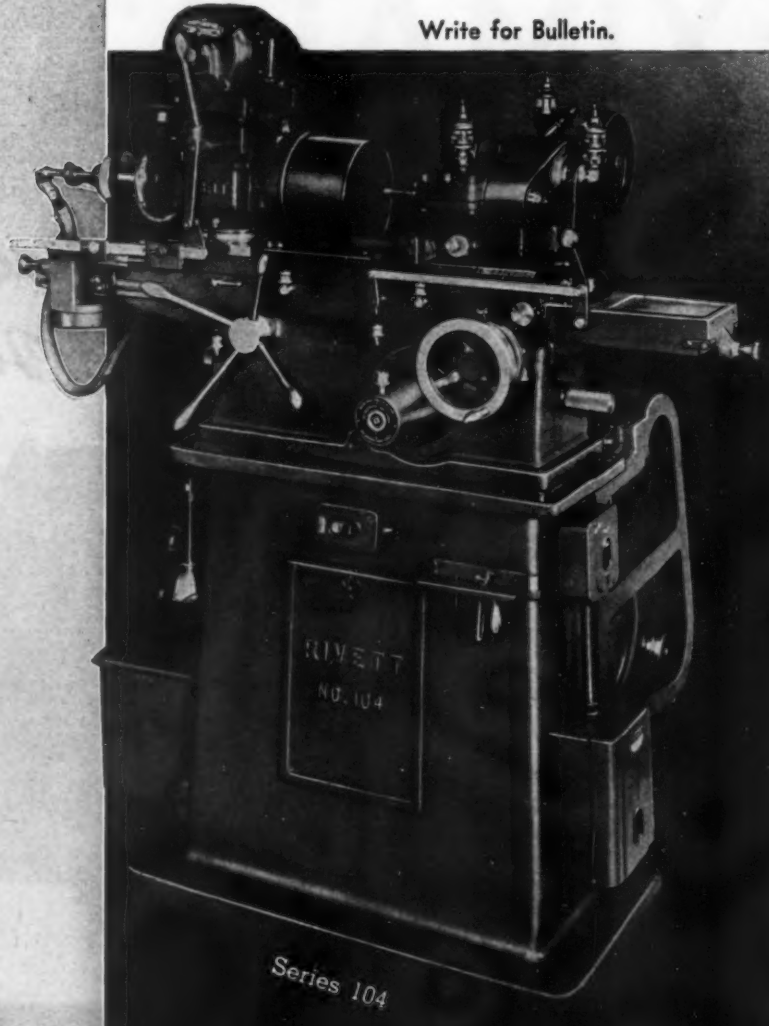
RIVETT

INTERNAL-EXTERNAL GRINDERS FOR DIE AND TOOL-ROOM WORK

Rivett grinders are particularly suited to the diversified work of the tool-room. Available internal and external spindles, ease of set-up and many adjustments, make practical a wide variety of grinding operations.

Two sizes of Rivett grinders are offered to cover the normal range of tool-room work. Series 104 has grinding capacity up to 3" diameter by 4" length. Series 112 has grinding capacity up to 8" diameter by 8" length.

Write for Bulletin.

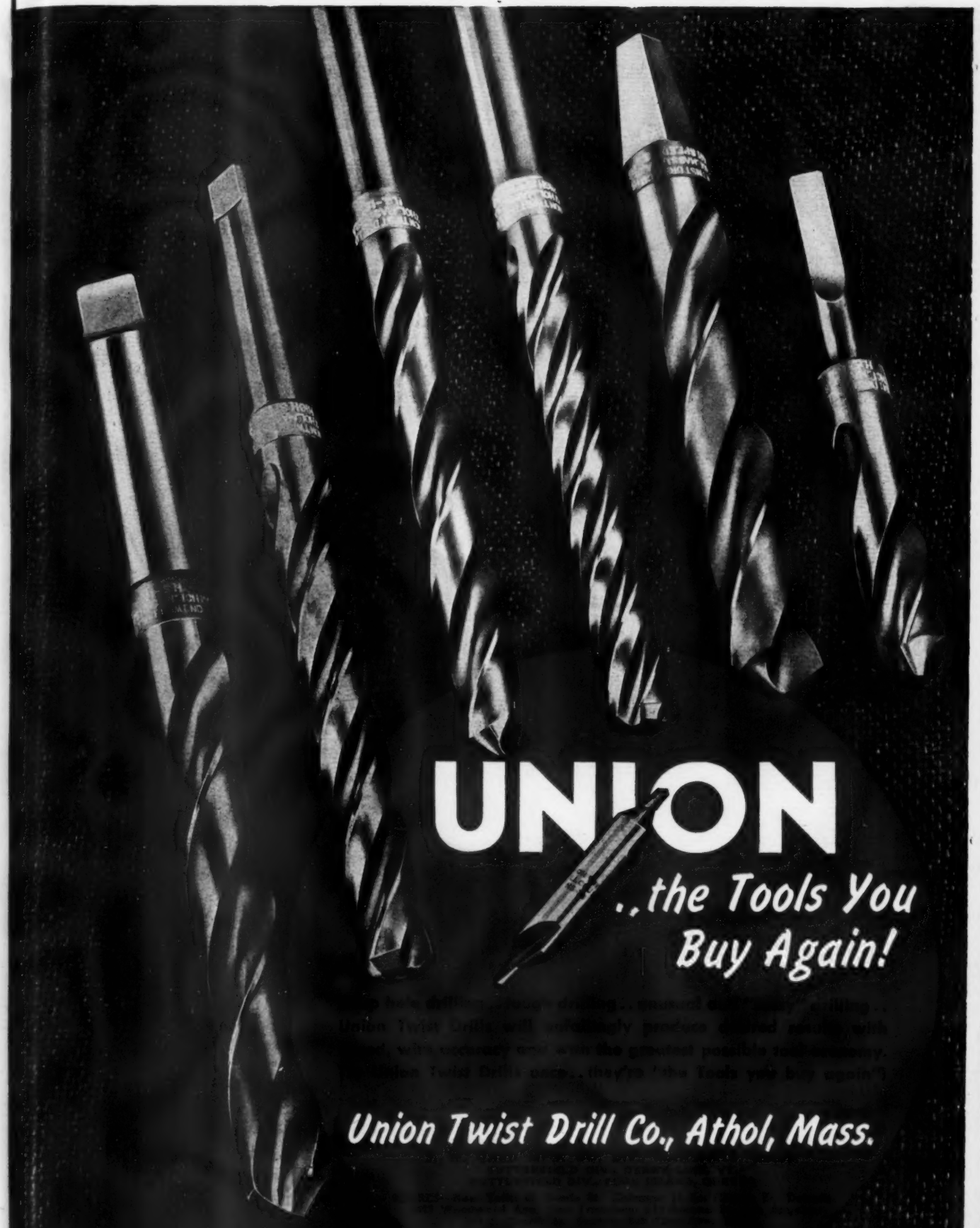


Series 104

ARMY E NAVY

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.


UNION
..the Tools You Buy Again!
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

CARD
Round DIES

S. W. CARD MFG. CO.
MANSFIELD, MASS.

STORES
New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 5527 Woodward Ave.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

UNION ★ BUTTERFIELD ★ CARD

In wartime as well as peacetime production, tool economy is a desirable asset. Butterfield Taps—in all sizes, types and thread forms – feature tool-saving and time-saving qualities to assure long, accurate and economical service. You get Quality when you order
Butterfield
TAPS
Divisions of the Union Twist Drill Compa

When is a Used Machine Tool a Good Buy?

There are two things you must be sure of before reaching the correct answer to that question.

1. Be sure the purchase price of the used machine, plus the cost of putting it in proper condition, will be less than the cost of a new machine of equal performance.
2. Be sure the used machine is a model that will do the work you plan for it—at the degree of precision you require and at costs that will help you meet competition.

Probably there will be hundreds of Acme-Gridley Automatics offered for sale by war plants having no further use for them.

Some of these were tooled as special-purpose machines. Others are general-purpose machines. All of them were up to the highest Acme-Gridley standards of precision and production capacity, model for model, when delivered.

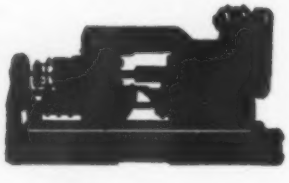
But there are no records to tell which of them might have been overworked or abused, or whether they have had proper care.

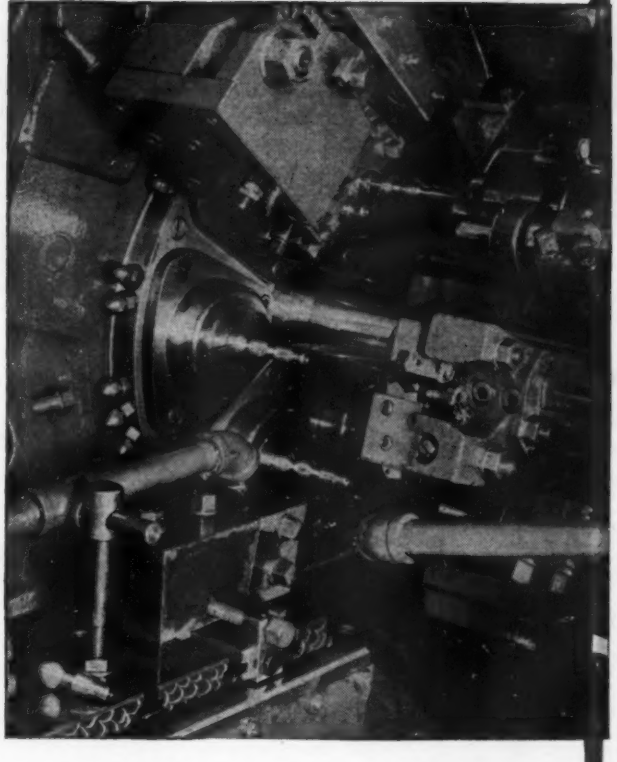
We are interested in seeing that new owners get value received when the machines change hands. So we suggest that you consult us before completing arrangements to purchase any used Acme-Gridley Automatic.

The Modern Way to Cut Production Costs

Here is a 200,000 run job, requiring 9 operations. Tolerances are exacting. Produced on a 1" Model RA-6-Spindle Acme-Gridley Bar Automatic in less than 6 seconds.

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.





THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

SIZE UP YOUR MOTOR NEEDS

before you "freeze" design . . .

ASK A WESTINGHOUSE APPLICATION ENGINEER TO HELP

After the desigh is "frozen" and your apparatus is tooled, changes to accommodate the motor may be costly and time-consuming. Make certain you select the right motor before you go ahead with design. Make sure, too, that you use existing motor designs wherever possible, and avoid the extra cost of specially-engineered motors.

Standardized designs offer a number of advantages: lower cost, faster deliveries, reduced inventories and simplified servicing.

Westinghouse engineers have been applying fractional horsepower motors for decades, and have built into standard motors many special features to meet particular service requirements. Before you "freeze" design, ask for Westinghouse engineering help. Call your Westinghouse office or write Westinghouse Electric & Manufacturing Co., Lima, Ohio. J-03227

Westinghouse
SMALL MOTOR DIVISION

MOTOR EXCHANGE PLAN PROVIDES

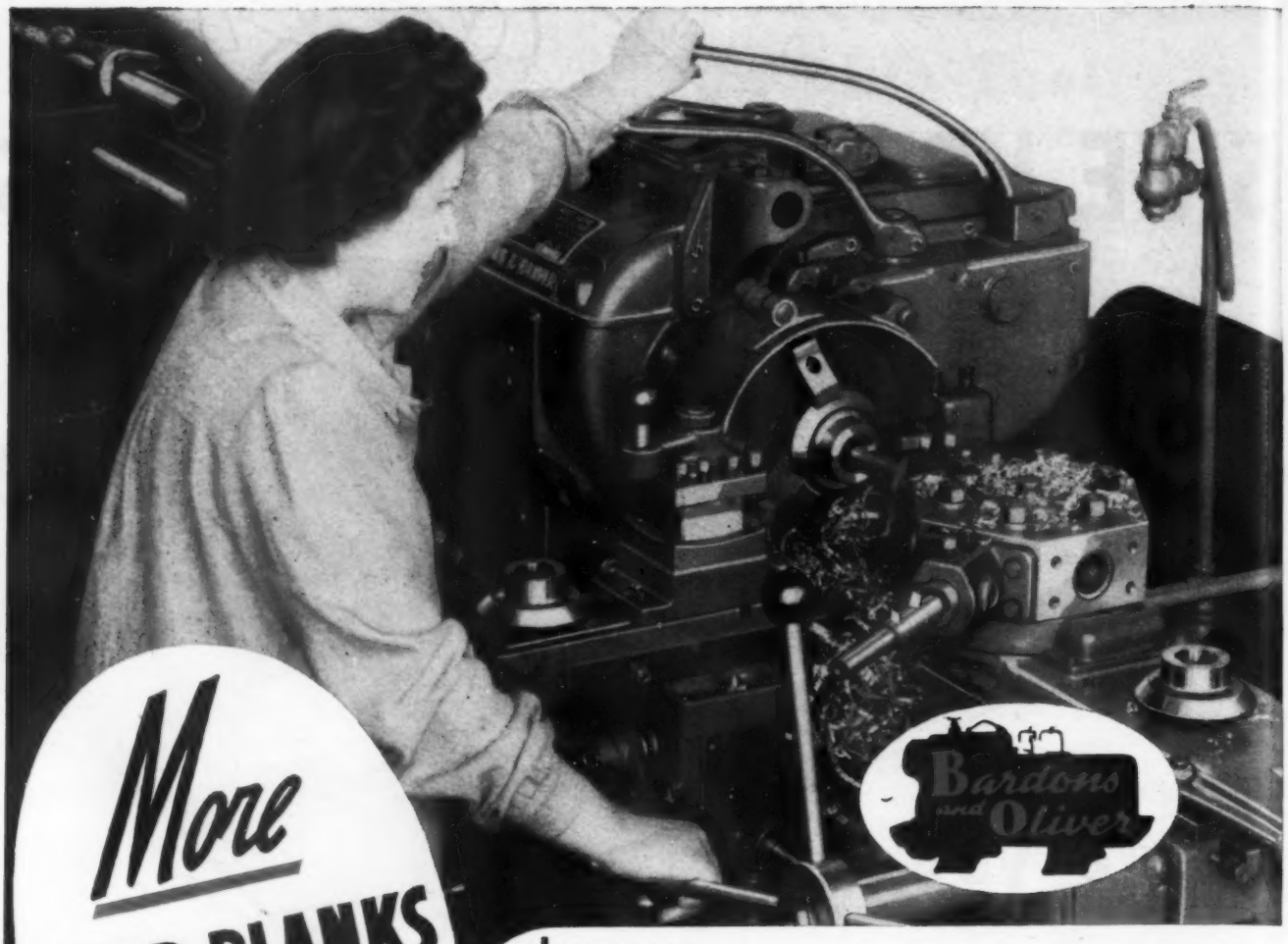
REPLACEMENT SERVICE IN 24 HOURS OR LESS

ANYWHERE IN THE UNITED STATES

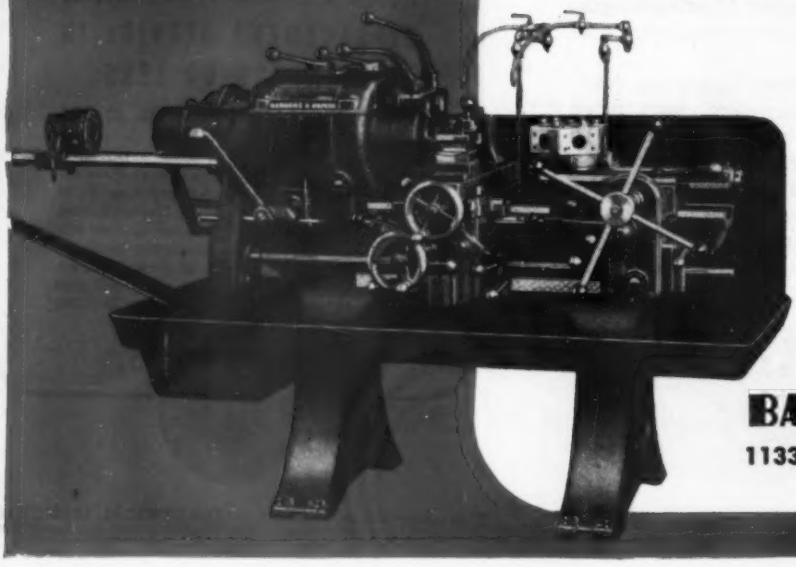
Westinghouse Motor Exchange points in all principal cities can service most Westinghouse small motors of standard sizes in 24 hours, or less, anywhere in the United States. This service gives the appliance user an efficient, factory-rebuilt replacement motor in exchange for his old motor at a low, flat cost. Your nearest Westinghouse office will give you full details. Ask for bulletin B-3336.

WESTINGHOUSE

This advertisement appears in ELECTRICAL MANUFACTURING and PRODUCT ENGINEERING for April, 1945



More GEAR BLANKS per day—

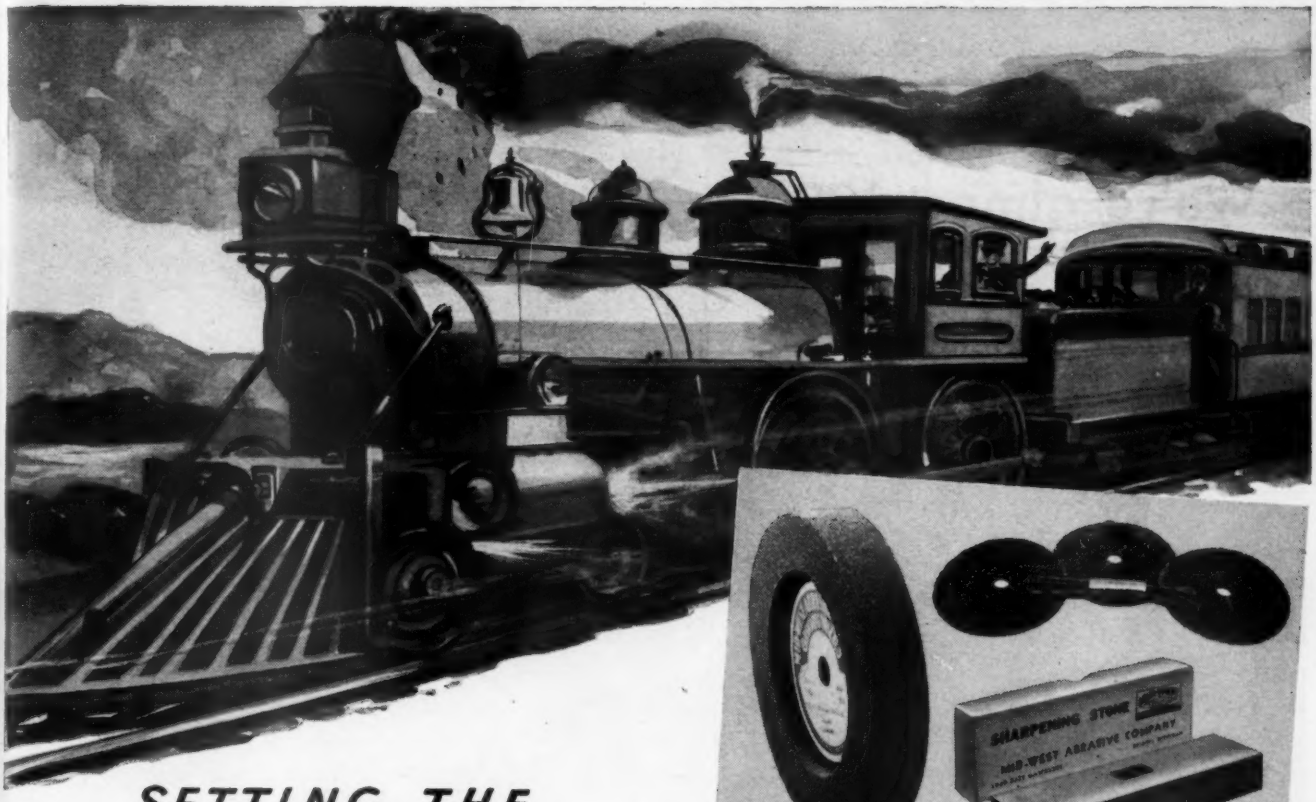


because

THE HYDRAULIC SPINDLE BRAKE STOPS THE CHUCK INSTANTLY. No extra effort is required by the operator. By moving the control lever from driving to neutral position, a powerful yet elastic multiple disc brake is applied. No loss of time, no additional effort called for. The chuck is ready for unloading and re-loading.

This is only one of several new features recently incorporated in The Bardons & Oliver No. 3 Universal Turret Lathe.

BARDONS & OLIVER, INC.
1133 WEST 9TH STREET CLEVELAND 13, OHIO



SETTING THE

PACE!

Fifty years ago and more, the old wide-funnelled locomotive set the pace for any known means of transportation.

Today, the Mid-West Abrasive Company is a pace-setter for high-quality, dependable abrasive products, each engineered to perform a specific job with speed and perfection.

There are Mid-West items for every abrasive need —grinding wheels, sandpapers, honing stones, sharpening stones, wheel dressers or abrasive specialties.

The Mid-West staff of field engineers is ready at all times to survey your problems and advise you.

Deliveries are prompt on all items in the far-ranging Mid-West line.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • Detroit • Rochester, Pa.

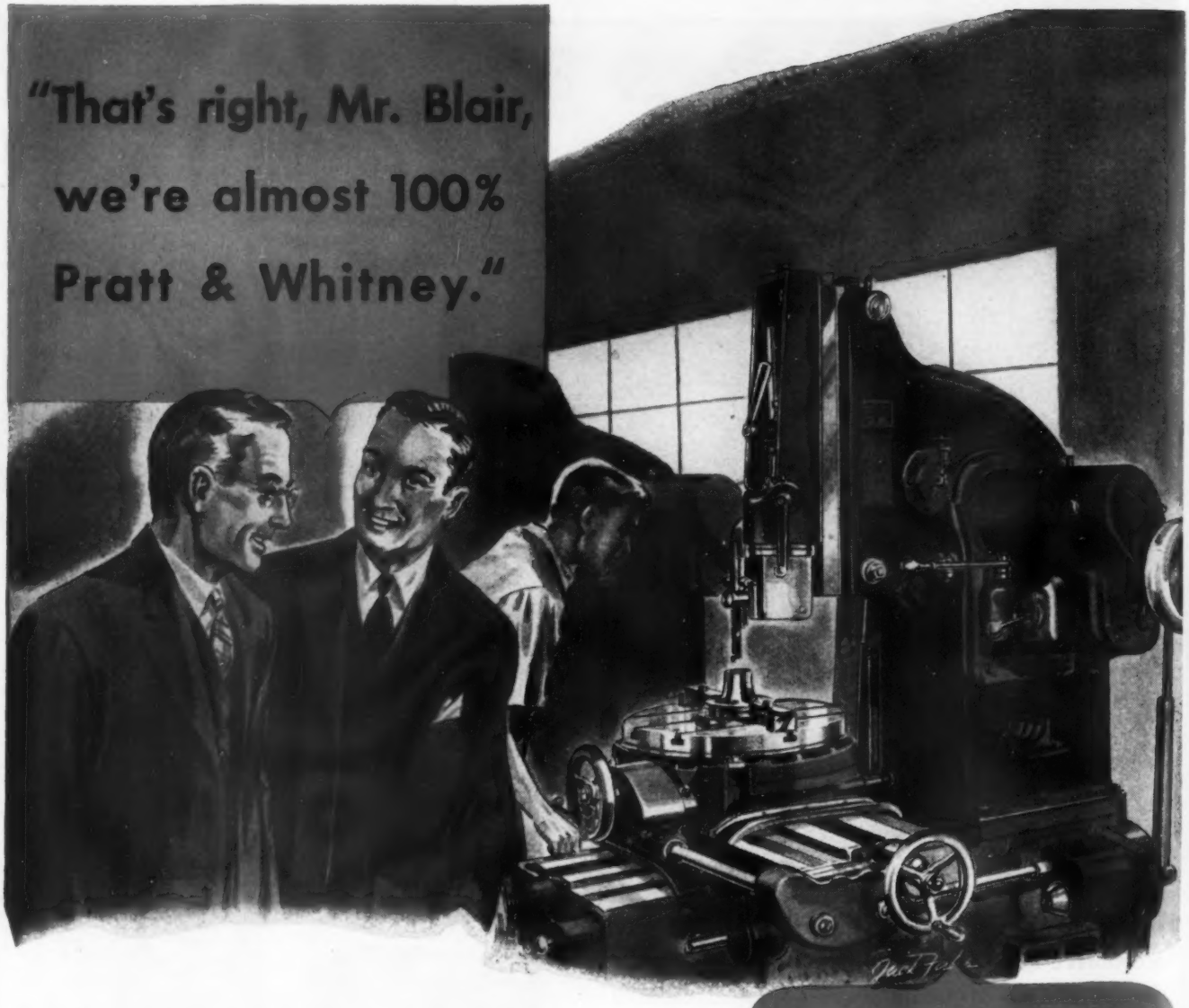
Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Mich.

Please send complete data book on ☐ Grinding Wheels, ☐ Sandpapers, ☐ Superfinish Stones

NAME _____

ADDRESS _____

"That's right, Mr. Blair, we're almost 100% Pratt & Whitney."



This is happening over and over again. The name Pratt & Whitney on toolroom equipment spells quality to buyers of production tools. Manufacturers looking for tools, dies, jigs, and fixtures will invariably lean toward the shop with Pratt & Whitney precision equipment.

It is perfectly logical. The better-equipped a tool shop is, the finer quality and accuracy it can produce. For better than 85 years, Pratt & Whitney machine tools, small tools, and gages have proved that there is no substitute for quality . . . that *there is no better paying investment than the right tools for the job.*

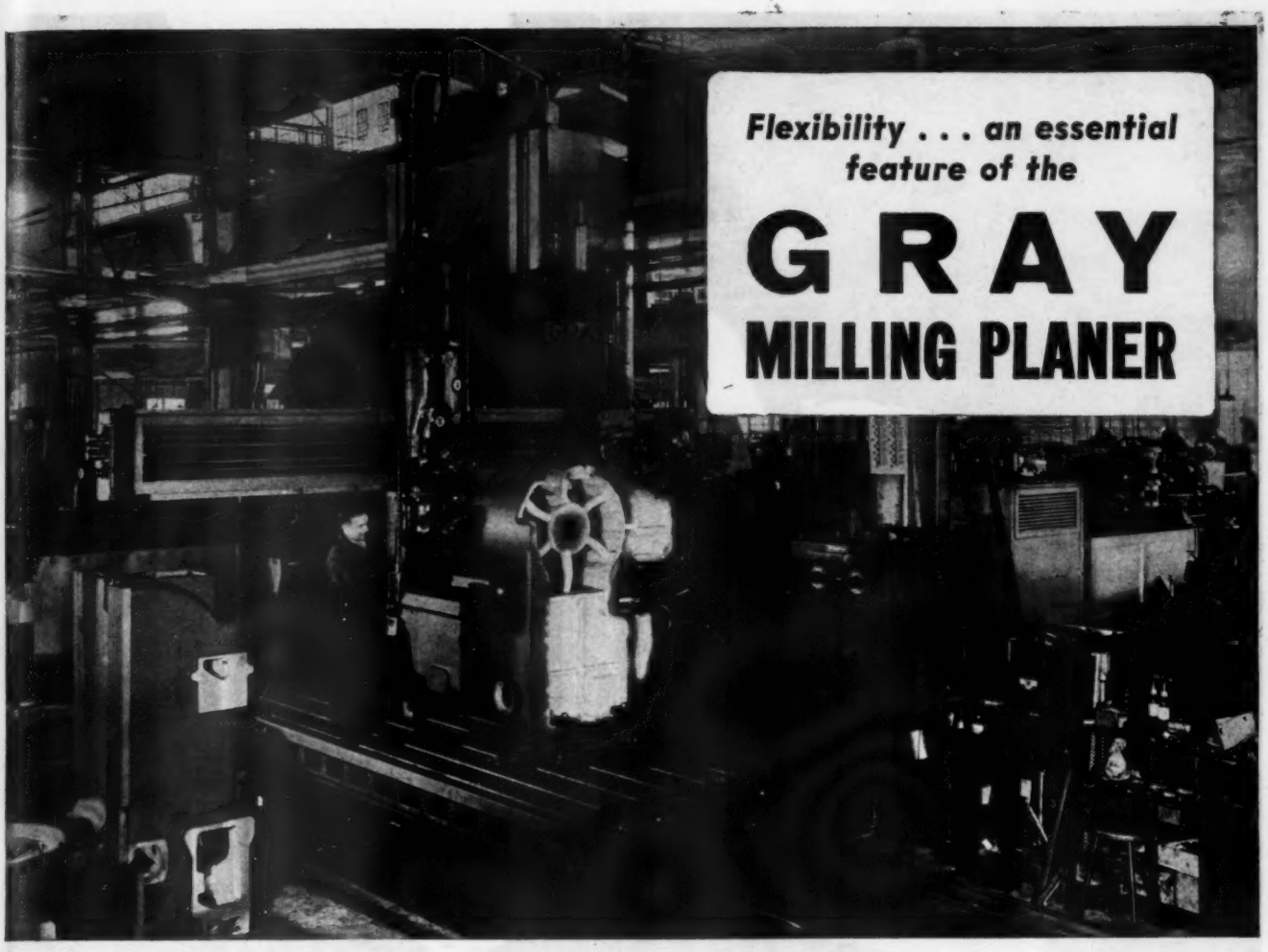
Whether you need new tools, dies, or fixtures now, or are laying your plans for later reconversion, you will be wise to deal with a shop that insists on using Pratt & Whitney equipment. You have every reason to expect finer quality . . . and chances are that you will get faster delivery.

"Handiest machine in the shop" . . . The Pratt & Whitney Vertical Shaper machines hard-to-reach surfaces and bosses without special tools . . . will tackle all sorts of irregular shapes . . . is indispensable in any toolroom. For full information on this and other P&W products write Pratt & Whitney direct. The precision, long life, and dependability of P&W equipment always pays dividends to the tool shop owner and his customers.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT



Flexibility . . . an essential feature of the

GRAY MILLING PLANER

● The flexibility of the Gray Openside Milling Planer is clearly demonstrated in this view of a milling planer machining the base of a Bullard "Cut Master" Vertical Turret Lathe.

On this particular job a milling operation is being performed with a Right Angle Head. However, this Openside Milling Planer can be used as well for planing, drilling and boring. Here is a particularly versatile machine offering a wide range of operations on all types of work. It permits performing several operations from one set-up.

Every hour spent on set-ups is wasted as far as production is concerned. The Gray Milling Planer saves set-up time.

Any combination of planing heads and milling heads can be furnished.

If you have difficult set-ups, investigate the Gray Milling Planer.

It planes and mills
It bores and drills

THE G. A. GRAY COMPANY

3610 WOODBURN AVENUE • • • CINCINNATI 7, OHIO, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines

For the past thirty years men who now are old timers in machine shops have been working on Axelson Lathes. . . Their toil worn hands, moving skillfully over the controls of these machines year by year have gained new skill as the Axelson Lathe reached towards its full stature. . . Old hands have learned new wrinkles as the capacity of the machine has been increased and refinements have been added for ever better control and operation.

. . Many of these old hands rest upon the sleek surfaces of the *Axelson Lathe* with the touch of admiration and affection for a machine that has kept pace so well with an exacting trade, in most exacting years. For the best work at lowest per-piece cost, you need an *Axelson.*

BUY WAR BONDS!

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

Send for Full Information

It is not possible to explain the extraordinary versatility; the speeds suited to any job; the power and the built-in precision of an Axelson engine lathe in a few words. Lathe Bulletin 4401, with its beautiful 4-color 17x22" illustration of this machine tool, is available to you free. A post card will bring it by early mail.

AXELSON MANUFACTURING COMPANY

6160 S. Boyle Ave., (Box 98, Vernon Station), Los Angeles 11, Calif.
'50 Church St., New York City 7 · 3844 Walsh St., St. Louis 16, Mo.

AXELSON LATHES

Dependable for over a Quarter Century

STANDARD

Announcing

DuBo

The Better **PLUG GAGE**

FIXED LIMIT TYPE

Color Signals

GREEN = GO

RED = NOT GO

PATENTS PENDING

Newest Development in Simple, Precise, Effortless BORE GAGING

Again STANDARD pioneers in producing DuBo, newest, most completely satisfactory bore checking gage of the fixed limit type yet produced. DuBo brings to bore gaging new, effortless, finger-tip control, assured precision and speed far beyond the scope of ordinary plug gages . . . whether used by skilled or unskilled workers. Vivid color bands unmistakably identify "go" and "not go" members; unusual lightness and balance minimize fatigue and fatigue-errors; simple manipulation makes DuBo ideal for use at bench or machine.

Simple, yet Precise... Light, yet Sturdy

EASY TO USE... TELLS MORE

Spherical shape, ingenious chamfering and relief, make entrance easy, gaging positive.

★

May be entered into bores actually smaller than gage diameter without forcing or marring work piece.

★

"Go" and "not go" color signals prevent confusion, fumbling, wasted motions, faulty readings.

★

Chamfer edge helps clean bore and prepares clean surface for accurate gaging.

★

Finger-tip "feel" and control reveal true internal conditions at any point in bore.

★

Reveals out - of - roundness, taper, belling and dimensional deviations by unmistakable tilt of handle.

★

May be used in deep bores and close to bottom of blind bores.

Write! Send NOW for illustrated DuBo bulletin . . . tells all about this remarkable new gage.

STANDARD GAGE CO., Inc.

Poughkeepsie, N.Y.

"Put it on the Blanchard"

...GET THESE ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving
Operation Saving ✓
Material Saving
Fine Finish ✓
Flatness ✓
Close Limits ✓

GRINDING TURBINE VALVE CHEST COVER ON NO. 18 BLANCHARD

This job is a good example of the way Blanchard No. 18 Surface Grinders are eliminating hand scraping on parts which require flat surfaces and steam-tight joints.

The steel casting measures 38½" long, 12½" wide, and 13" high and .008" of stock is removed from one side of high test cast steel—each piece is finished in 83 minutes.

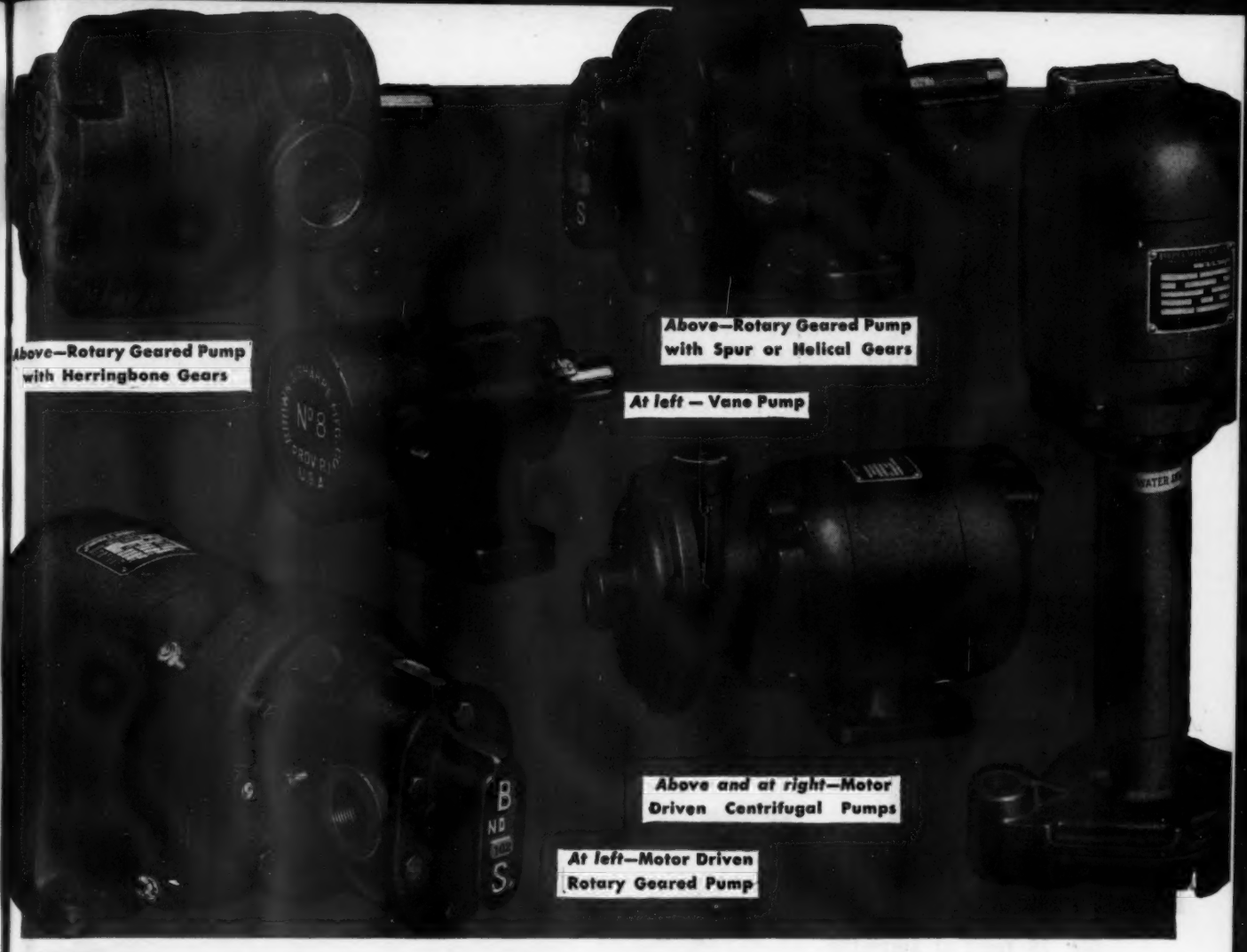
When you grind work like this on a Blanchard you get the accuracy needed for tight joints and correct alignment without sacrificing production.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.


Above—Rotary Geared Pump with Herringbone Gears
Above—Rotary Geared Pump with Spur or Helical Gears
At left — Vane Pump
Above and at right—Motor Driven Centrifugal Pumps
At left—Motor Driven Rotary Geared Pump

PUMPS -FOR MANY USES

PRECISION MADE—RELIABLE LONG WEARING

—for Lubrication—Supplying Coolant—Circulating Purposes Transfer Work—Hydraulic Installations

ROTARY GEARED

Available with Spur, Helical and Herringbone gears with capacities from ½ to over 37 G.P.M. at 0 lbs., and for pressures up to 500 lbs. per square inch. Bronze pumps for water and saline solutions. Also reversible types for equipment that reverses.

VANE

Maintains same direction of delivery when rotation is reversed. .23 to 1.37 G.P.M. at 0 lbs.

MOTOR DRIVEN ROTARY GEARED

Capacities 3 to 18 G.P.M. at 0 lbs. Electrical characteristics cover wide range of current supply.

MOTOR DRIVEN CENTRIFUGAL

Capacities with water up to 70 G.P.M. at 8 ft. head. Submergence types. Also compact types; one with motor having an integral mounting bracket as shown above and another with integral flange mounting which serves as intake.

SPECIAL

Designs of Brown & Sharpe Pumps lend themselves to special installations—for use as duplex units—and for flange mountings.

Pump Catalog showing complete line of Geared, Vane, Motor Driven and Centrifugal Pumps sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

B·S

. . . We urge buying through the Distributor

BROWN & SHARPE

Snyder Special TAPS 61 HOLES IN AIRCRAFT PART

Tapping 61 holes of various diameters and in various positions on a large aircraft housing is the job for which Snyder designed and built this automatic-cycle special-purpose machine.

When the starting button is pressed, slide and part automatically move left to the first work station where a large vertical multiple spindle tapping head and several horizontal and angular tapping units go through their automatic cycle operation.

Slide and part then automatically move right to the second work station where another group of vertical, horizontal and angular tapping spindles automatically go through their operating cycle. All tapping spindles have individual lead screws.

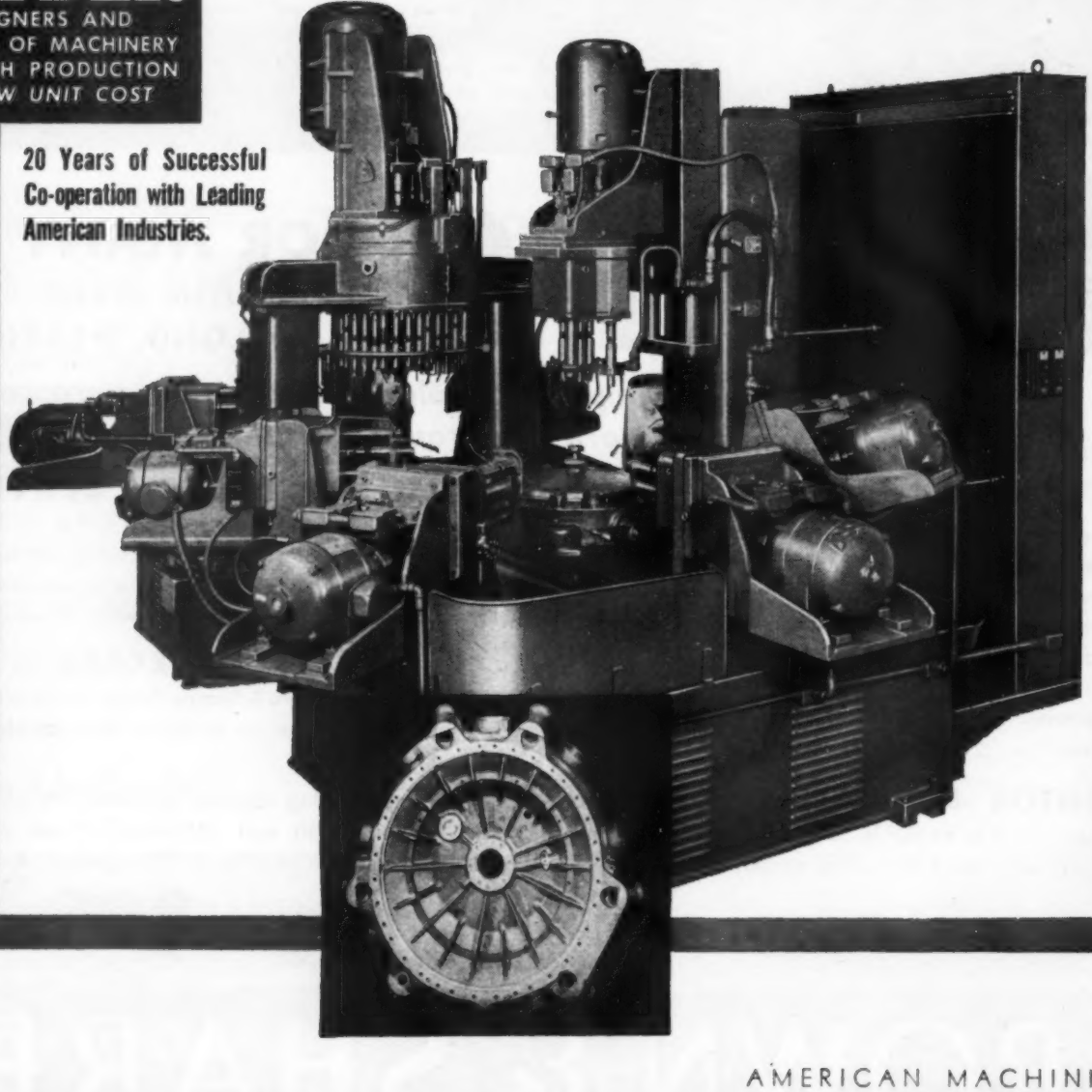
Some of these tapping units are installed on hydraulically operated sub-slides to provide rapid advance of the unit before lead screw tapping. For example, the vertical head in the left hand station has a large group of spindles on the periphery which has no hydraulic advance. However, a cluster of spindles in the center of the head is automatically advanced into tapping position several inches lower than the outer spindles.

Master control is near loading position and each tapping unit has individual push button station for set-up purposes. Machine base is welded steel.

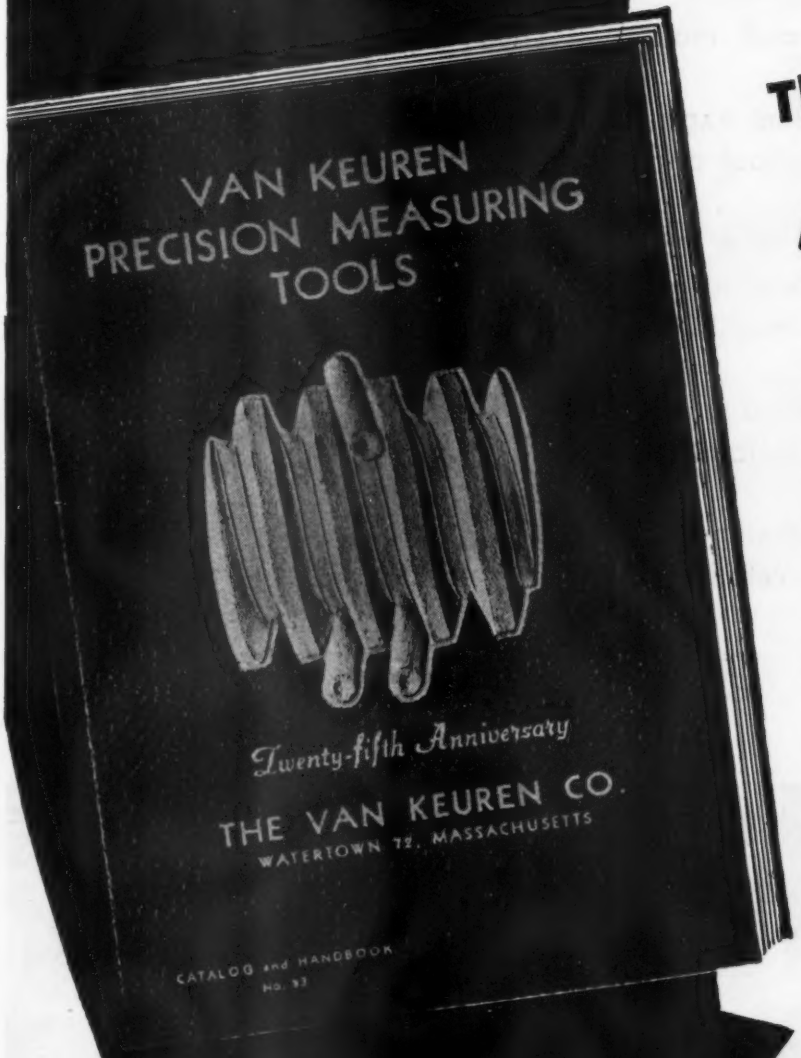
If your present or prospective operations can benefit from establishing complete control of production speed, accuracy and finish, Snyder special-purpose machines may be the answer. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries.



1945 REVISED EDITION
NOW READY FOR DISTRIBUTION



The NEW *Van Keuren* CATALOG and HANDBOOK No. 33

This new, revised Technical Catalog and Handbook contains 160 pages of practical, useful information in ready reference form on precision measuring. It describes, by text and illustration, various accepted methods and equipment for checking accuracy to hundred thousandths and millionths of an inch.

Through the use of the Van Keuren equipment described in this handbook, many outstanding improvements in production and product quality have been attained, and closer tolerances more easily achieved.

PARTIAL LIST OF CONTENTS

NEW PRODUCTS:

New Light Wave Equipment with fused quartz optical flats.
New Laboratory Type Monochromatic Light.
New Solid Square Master Blocks having permanent accuracy.
New and complete Gear Measuring Tables from 5 to 500 teeth.

ENGINEERING DATA

How to measure standard and special screw threads.
Screw Thread data including tables of basic diameters and tap drill sizes for all American threads.
Thread proportions for American and Foreign threads.
Bureau of Standards measuring wire specifications.
How to measure spur and helical gears.
How to measure angles.
How to use optical flats.
Notes on gaging holes.

THE *Van Keuren* COMPANY

176 WALTHAM ST., WATERTOWN 72, MASS.

MAIL COUPON TODAY FOR YOUR COPY

25th Anniversary

THE VAN KEUREN CO., 176 WALTHAM ST., WATERTOWN 72, MASS.

Kindly send me a copy of your 1945 New and Revised Catalog and Handbook No. 33. It is understood that this request incurs no obligation.

Name .....

Position .....

Company .....

Address .....

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling of tool and production work

THE fastest producing and most accurate machine in the field.

Many users are reporting consistent experience of two to three times the output and higher quality work.

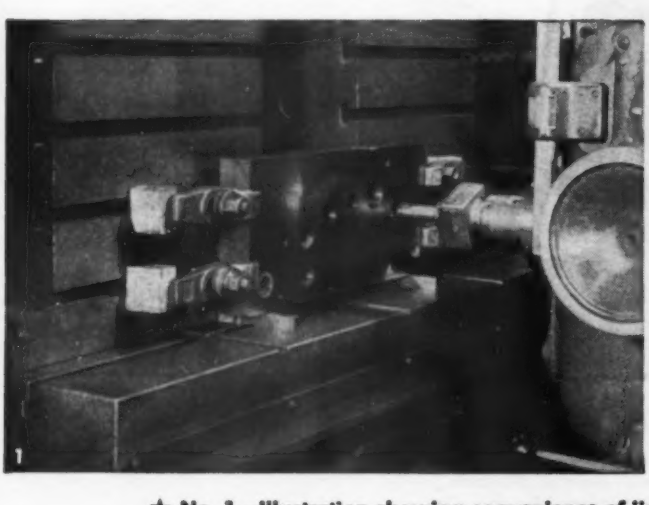
Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch).

Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work.

Unique operation and controls that make possible high precision work with relatively little skill.

★ ★ ★

JIGMIL—The world's finest BORING and milling machine is made in Detroit.



★ No. 1—Illustration showing convenience of jig plate boring. No. 2—Eight holes precision bored. Holes spaced within .0001 with total dependence of all spacing on automatic positioning means.

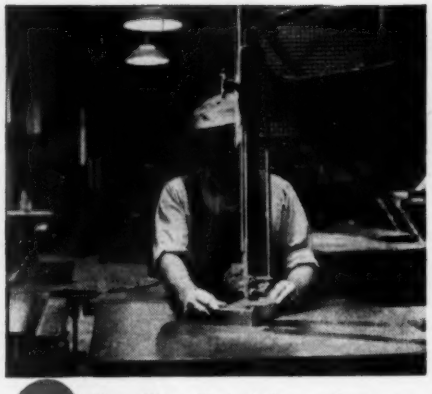
DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

HOW TO REDUCE THE HIGH COST OF PLANT ACCIDENTS

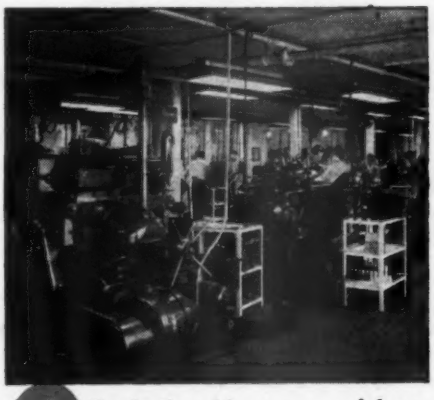
Correct lighting—with properly applied G-E Lamps—offers important new savings in manpower and materials. Here are specific results:

1 **Machine Operators** work faster and safer in this plant using high-level, eye-easy illumination provided by G-E Mazda Lamps. Good machine lighting promotes safety, reduces accidents.

2 **Overcome Visual Strain** and watch your rejects go down! G-E Lamps, above, furnish high intensity illumination at low brightness . . . enable new workers to learn faster, make fewer errors.



3 **Handling Materials** on fast-moving machinery calls for caution —*plus* adequate glare-free lighting for safety. G-E Mazda Lamps help provide it in this wood-working shop.



4 **Production** hits top speed here —thanks to an even spread of diffused G-E Fluorescent lighting that reaches into those dark corners where the accident potential is highest.

TURN TO G-E: Whether it's lighting for safety . . . or more production at lower cost . . . or for lighting that can make postwar products sell quicker and easier . . . General Electric makes the lamps for every lighting need. Call on your G-E lamp supplier.

REMEMBER: Safer production starts with good lighting—and good lamps are the heart of good lighting. Be sure the lamps you buy are marked G-E.

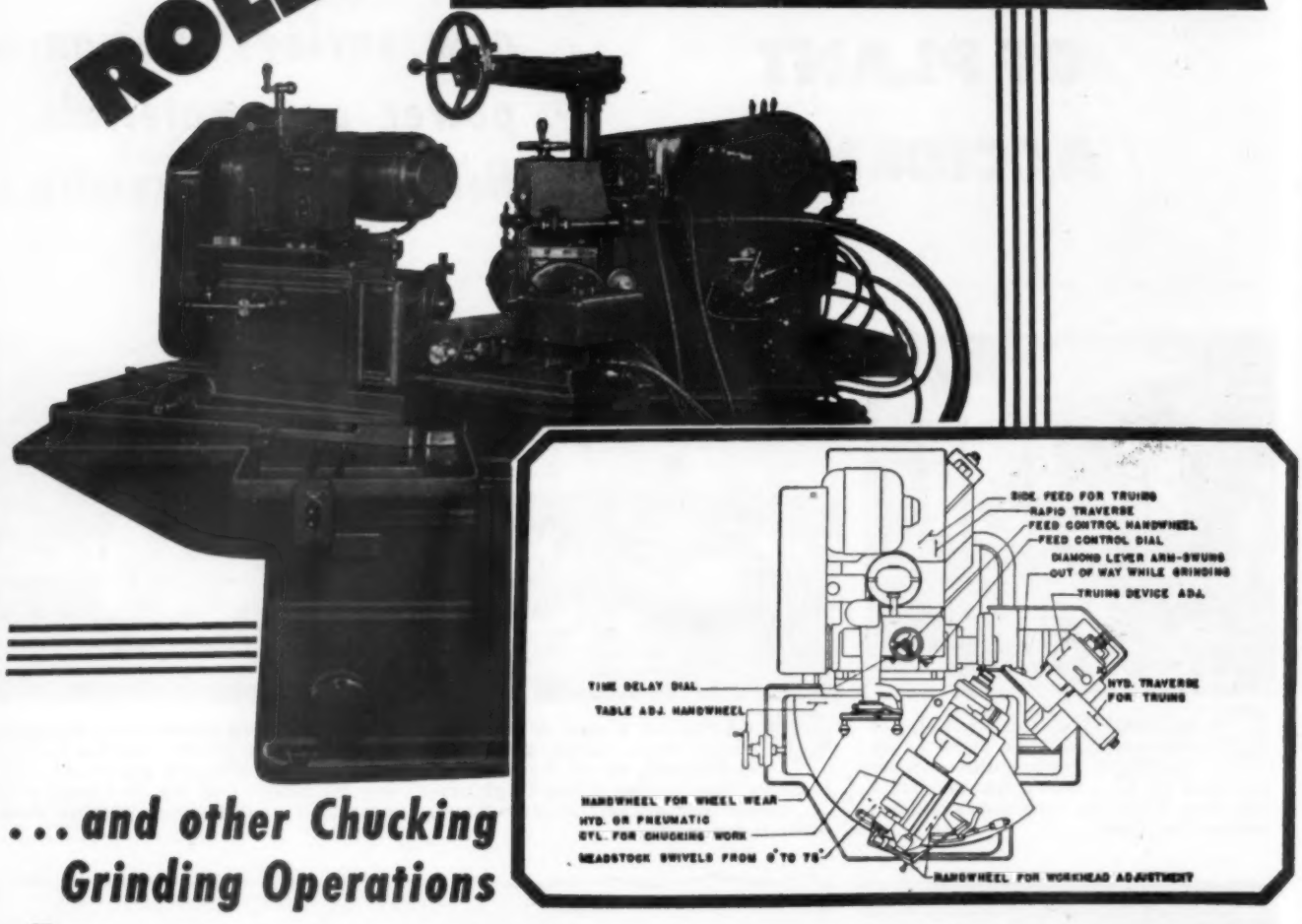
G-E MAZDA LAMPS

GENERAL ELECTRIC

BUY MORE WAR BONDS

Hear the G-E radio programs: "The G-E All-Girl Orchestra," Sunday 10:00 p. m. EWT, NBC; "The World Today" news, Monday through Friday 8:45 p. m. EWT, CBS; "The G-E Houseparty," Monday through Friday 4:00 p. m. EWT CBS.

GRIND ROLLER BEARING RACES ON A FITCHBURG


SIDE FEED FOR TRUING
RAPID TRAVERSE
FEED CONTROL HANDWHEEL
FEED CONTROL DIAL
DIAMOND LEVER ARM—SWUNG OUT OF WAY WHILE GRINDING
TRUING DEVICE ADJ.
TIME DELAY DIAL
TABLE ADJ. HANDWHEEL
HYD. TRAVERSE FOR TRUING
HANDWHEEL FOR WHEEL WEAR
HYD. OR PNEUMATIC CYL. FOR CHUCKING WORK
HEADSTOCK SWIVELS FROM 0° TO 75°
HANDWHEEL FOR WORKHEAD ADJUSTMENT

. . . and other Chucking Grinding Operations

THE latest Fitchburg Roller Bearing Race Grinder employs a single standard Fitchburg Bowgage Grinding Wheelhead Unit. The workhead is adjustable from 0 degrees to 75 degrees so that the machine can be used for many other straight or taper grinding jobs.

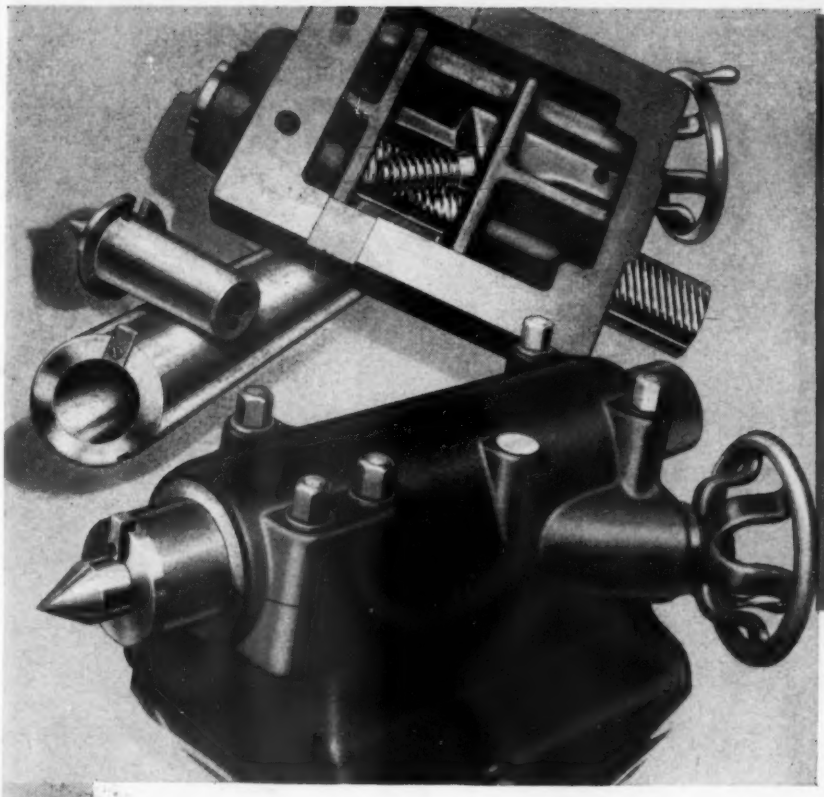
The Fitchburg Roller Bearing Race Grinder is completely automatic. By pressing a single button the wheelhead goes through its standard automatic cycle — rapid traverse to the work, proper grinding feed, spark-out time, and rapid return. Work is held to limits of .0002" in production.

The workhead can be arranged either hydraulically or pneumatically for collet clamping or other chucking devices.

In this taper grinding application, the wheelhead is mounted on a 45° slide for trueing. The trueing device is mounted on the side of the base parallel to the wheelhead, and is hydraulically operated for trueing, with micrometer adjustment for positioning.

For grinding roller bearing races a Fitchburg grinds them faster and more accurately than other methods. A leading American manufacturer reports enthusiastically on the quality and low production cost of this machine. Write us today for complete information.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, both Full Universal Grinders and Special Purpose Grinders



TURNING QUESTIONS *Answered!*

WHY A THRUST LOCK TAILSTOCK?

Because it incorporates an ingenious automatic control that also acts as a fool-proof lock. This control, operating on the worm and gear principle, enables the spindle to be run to position and held there without further locking or clamping. The spindle is extra long with a full accurate bearing almost the entire length of the tailstock. The off-angle of the hand-wheel allows bar stock to pass through the spindle hole. The thrust-lock tailstock is another outstanding LeBlond feature.

★

SINCE 1887

the world has been turning to LeBlond for turning equipment.

★

WRITE FOR CATALOG!

LEBLOND FIELD ENGINEERS ARE AT YOUR SERVICE to help you in your development work, particularly along the lines of the difficult, the "out of the ordinary" turning problems. The accumulated knowledge of every manufacturing trend in good times and bad—peace and war—gained over a period of nearly 60 years from thousands of installations all over the world, is yours for the asking. Contact our nearest dealer or write Dept. FE46.

ARMY E NAVY ★ YOUR BONDS BUY BOMBS ★ BUY A "BLOCK-BUSTER" TODAY!

THE R. K. **LeBLOND**

MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722

CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

Could you Machine this Work in 5 Simple Steps?

Photo courtesy
Parker Stamp Works, Inc.,
Hartford, Connecticut

A Milwaukee 2D Rotary Head Milling Machine milled this Walkie-Talkie part mold in 5 simple steps in a total time of 90 hours — a typical speed, economy, and accuracy performance. Here is the sequence of operations:

1—Strap both mold halves together in an upright position on machine table and mill "Ear" and "Mouth" sections complete.

2—Mill elongated sections for core guide.

3—Position mold blocks on machine table as illustrated, lay out and mill handle grip section complete.

4—Mill core guide and recesses to form small pass at the "Mouth" end of molded part.

5—Mount core holding plate in vise and mill 3 recesses.

Total machining time — 90 hours.

Check these advantages of the Milwaukee 2D Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single setup without the aid of templets or models, transmitting blueprint dimensions and outlines directly to the workpiece.

ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and setup time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

Kearney & Trecker
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation

For efficient operation, this stoker required a stepless, variable speed range from 5 to 80 rpm in the drive, varied according to the steam demands in the power plant.

Driving the stoker with a mechanical speed-changing device created too many problems. The drive used to convert pressure into mechanical energy was too bulky and expensive. And the variable-speed transmission ran too hot to be reliable.

The problem was solved with a Westinghouse Mot-O-Trol electronic control, equipped with a simple pressure-type actuator and Westinghouse Gearmotor. Stoker operation improved immediately, costs were lowered. This successful application of modern electronic control is but one example of the widespread use of Westinghouse Mot-O-Trol in countless jobs demanding smooth, stepless regulation.

You can get complete information from your nearest Westinghouse office. Ask for Bulletin B-3301, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-90568

Westinghouse Mot-O-Trol unit (lower photo) provided smooth, stepless regulation of coal feed, controlled by steam pressure to meet varying steam demands. The application of Mot-O-Trol controlled gearmotor drive to the stoker (top photo) supplied an output speed range from 5 to 80 rpm and increased operating efficiency.

Westinghouse

Electronics at Work

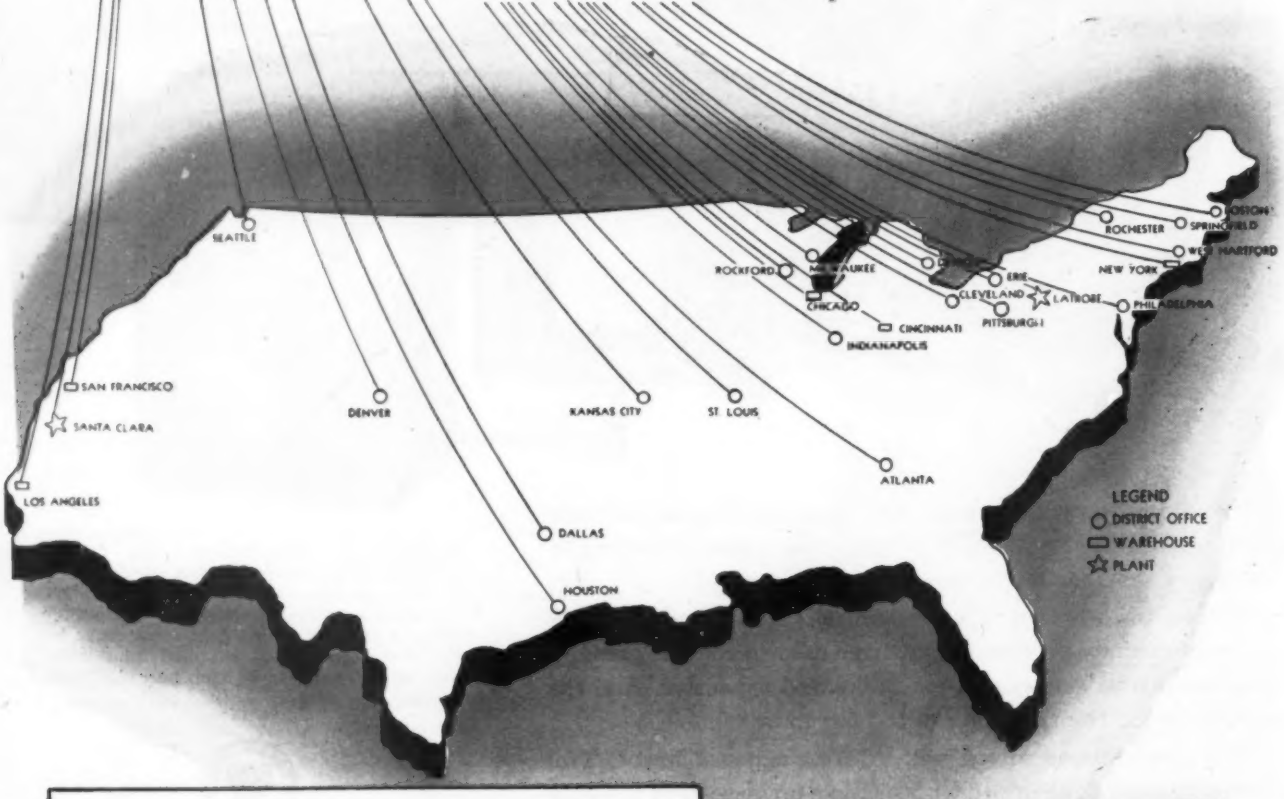
KENNAMETAL—THE ALL-AMERICAN CARBIDE

Serviced by a Nation-Wide Organization

The ingredient that distinguishes steel-cutting Kennametal from other cemented carbides (the unique intermetallic compound, $WTiC_2$) is an American invention, developed in 1937 by the president of Kennametal Inc. Using $WTiC_2$ as the key ingredient, he began making Kennametal tool blanks, of graded compositions suitable for different steel-cutting purposes, in a small plant employing twelve persons, at Latrobe, Pa.

Kennametal soon became established as the tool material that made possible machining of hard steel, accurately, at economy-promoting speeds. In eight years its use has spread, until today Kennametal Inc. has grown to such stature that it successfully serves hundreds of America's major metal-working plants.

Kennametal Field Engineers are more at home in these plants than in their own offices. Their on-the-spot "know-how" enables Kennametal users to obtain optimum production from a tool material that has demonstrated amazing inherent effectiveness. Call on them—they are at your service to help you get maximum output with minimum consumption of carbide.



HOW YOU'VE GAINED FROM KENNAMETAL'S GROWTH

Kennametal—constantly improved throughout the years—now costs its users less than one-tenth of what it did when introduced. This price reduction has been achieved wholly because of increased production and improved manufacturing technique—the very conditions that you can help to bring about in your metal-working plant, through proper utilization of Kennametal tools.

IT'S a fine, strong, steel mainspring for a serviceman's watch, but you mustn't touch—not if your fingers are moist with perspiration.

Because, as one war plant discovered, corrosion moves in where the finger has left its mark. Rejections were running high. Production schedules were threatened. And then General Electric Air Conditioning came to the rescue.

Installed in the assembly room, Air Conditioning kept workers' hands cool and dry—winter and summer. Because G-E equipment provides accurate regulation of both temperature and humidity.

Out of our rich and varied experience in helping war industries solve their problems, will come more compact, more efficient, more economical air conditioning and industrial refrigeration after victory. Would you like to be among the first to get all the facts on postwar equipment—when available? Write:

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 5695 Bloomfield, New Jersey.

GENERAL ELECTRIC

Air Conditioning

BUY and hold WAR BONDS

Tune in: The "G-E HOUSE PARTY" every afternoon Monday through Friday, 4 p. m., E W T, C B S . . . The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 P. M., E W T, N B C . . . "THE WORLD TODAY" News, Monday through Friday, 6:45 P. M., E W T, C B S

THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

Modern PRESSES

Cleveland 1-28-200 Single Point Press, stroke 6", adjustment 4", bed area 28" x 28", strokes per minute 30, capacity 200 tons.

Modern Cleveland Presses are built in three types, known as Single Point (illustrated), Two Point and Four Point, having one, two and four connections to the slide. These Modern Presses are designed with the gearing and drive unit arranged in the box type crown and this not only eliminates the necessity for overhanging brackets or other projections but conserves valuable floor space.

The gears run in a bath of oil and provision has been made for the easy removal of the gears and the drive unit, whenever necessary.

Each of the three types can be furnished in a wide range of sizes and capacities and with electrically controlled pneumatic or hydraulic friction clutch.

OTHER PRESSES OF THIS SERIES

Two Point

PRESSES HAVE A CONNECTION AT EACH SIDE OF THE SLIDE

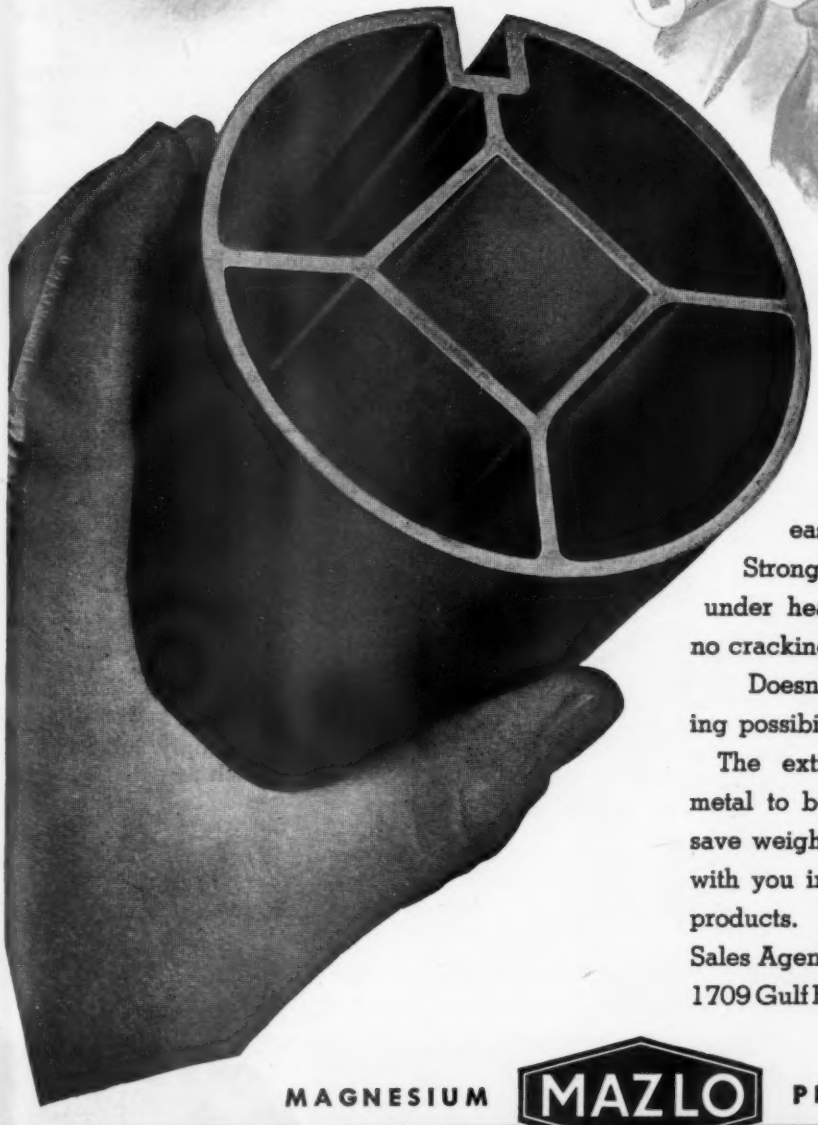
Four Point

PRESSES HAVE A CONNECTION AT EACH CORNER OF THE SLIDE

The CLEVELAND PUNCH & SHEAR WORKS Co.
CLEVELAND, OHIO

THINK IN TERMS OF MAGNESIUM

consider this extruded shape, for example



• This hollow extruded magnesium shape was designed by American Magnesium to give the textile mills a better cloth roll. It has a degree of permanence never before attained. Light in weight, these rolls make handling easier, simplifying a labor problem. Strong and stiff, they're able to stand up under heavy loadings. There's no distortion, no cracking, no splintering.

Doesn't this shape suggest some interesting possibilities to you?

The extrusion process helps you employ metal to best advantage. Magnesium lets you save weight most efficiently. We'll gladly work with you in adapting both advantages to your products. Aluminum Company of America, Sales Agent for American Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

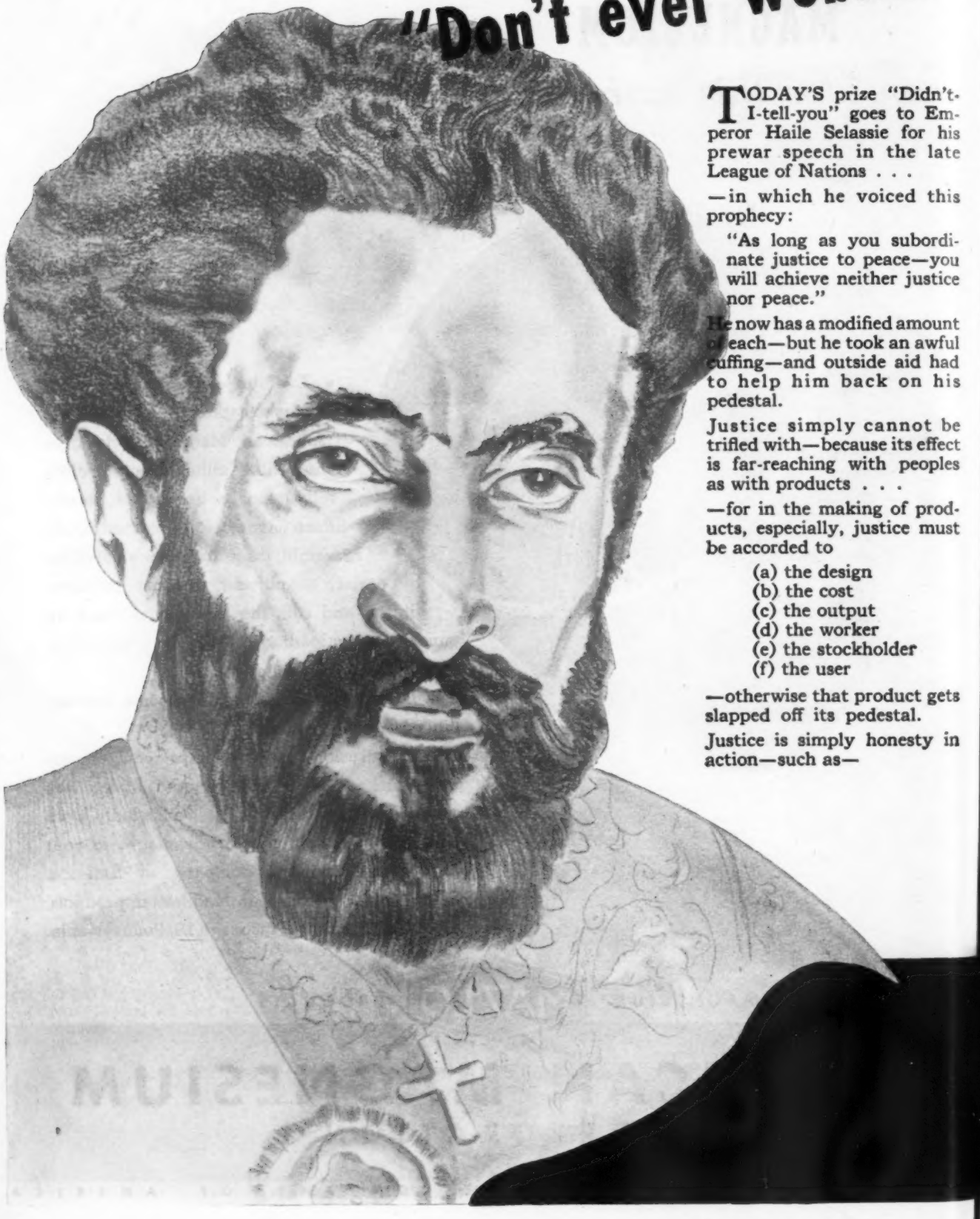
MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

then he said to himself

"Don't ever wobble"



TODAY'S prize "Didn't-I-tell-you" goes to Emperor Haile Selassie for his prewar speech in the late League of Nations . . .

—in which he voiced this prophecy:

"As long as you subordinate justice to peace—you will achieve neither justice nor peace."

He now has a modified amount of each—but he took an awful cuffing—and outside aid had to help him back on his pedestal.

Justice simply cannot be trifled with—because its effect is far-reaching with peoples as with products . . .

—for in the making of products, especially, justice must be accorded to

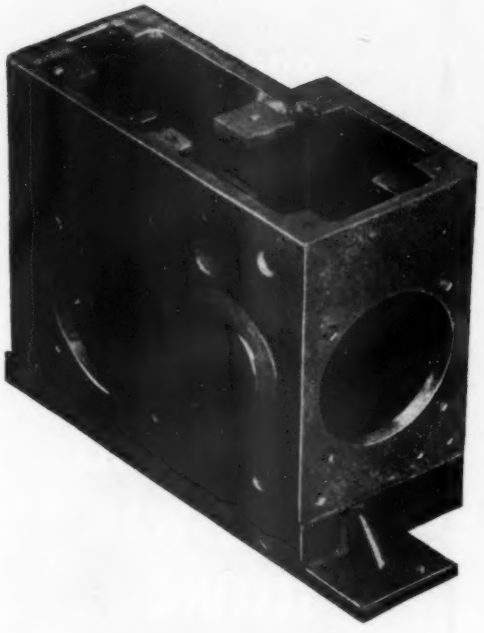
(a) the design
(b) the cost
(c) the output
(d) the worker
(e) the stockholder
(f) the user

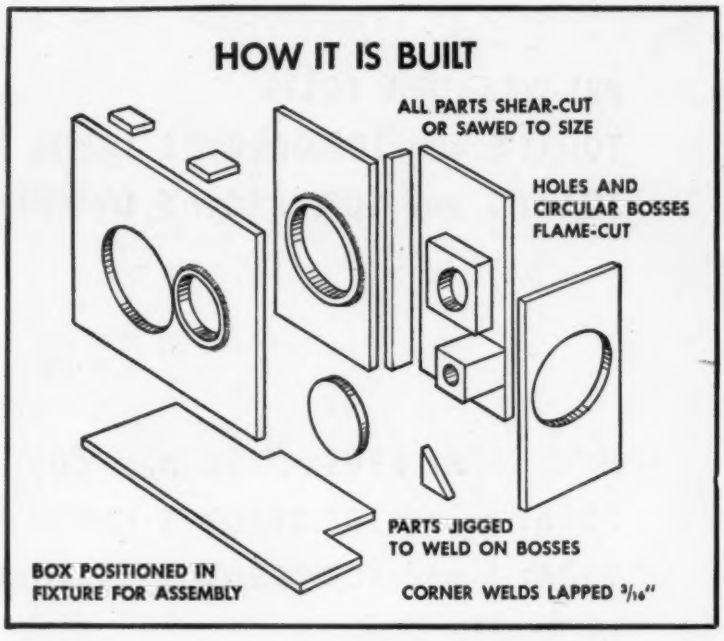
—otherwise that product gets slapped off its pedestal.

Justice is simply honesty in action—such as—

"Straight Thinking Pays"... *he says*

LOOK, EMPEROR, how straight thinking with Arc Welding keeps a product from being slapped off its pedestal:

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Gear case. A small, rather complicated design, typical of many machine parts of conventional construction. Converted to welded steel construction with these results:

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Rolled steel, applied exactly where needed, provides maximum strength with minimum weight. Cut weight from 100 pounds to 80 pounds.

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Former design $15.00.
Welded design $8.71.
Saved $6.29 or 42%.

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Standard steel material, cut and welded as required, speeds output and makes constant improvements easy and inexpensive.

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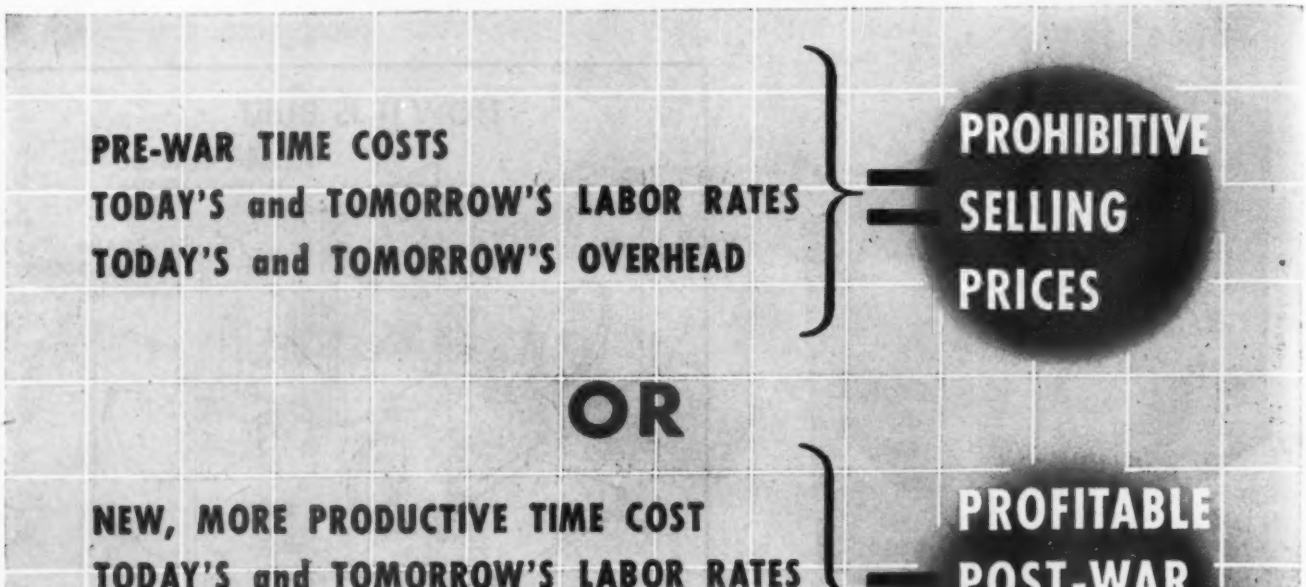

RING GAGE ACCURACY AT PRODUCTION RATES BY

MICROHONING

Microhoning offers to industry a new tool with which to meet post-war demands for better products at moderate cost—at possibly increased labor rates. A process of final machining, **Microhoning now assumes added responsibility—it removes from .010 to .030 stock under automatic sizing control. By providing ring gage accuracy *at production speeds*, it offers a way of using the second formula to achieve profitable post-war prices.**

It will correct error in bores, or on cylindrical or spherical surfaces, either before or after heat treating—providing form and size accuracy to "tenths." In removing stock, it does not cause heat cracks. By removing distorted surface metal and cracks left by previous operations, it eliminates two of the most frequent causes of fatigue failure.

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Micromatic Hone Corporation builds machines for Microhoning as required in industrial production. These range from tool room type machines arranged to handle a wide variety of work to multiple spindle production machines which provide accuracy and high speed on production parts.

Microhoning can be very useful in your post-war production. Let our engineers discuss applications with you.

MICROMATIC

MAKERS OF
AMERICAN MACHINIST

New MICROMATIC HYDROHONER MODEL 705

MULTIPLE SPINDLES

AUTOMATIC ROTARY INDEXING

MICROSIZE CONTROL

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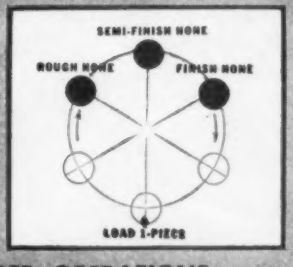
This new Micromatic Hydrohoner is a high speed production model, designed to produce large quantities of high precision parts. It may be used in multiple or progressive honing within uniform size limits (maximum) of .0003", on parts such as these:

Diesel Fuel Injectors, Pinion Gears, Precision Bearings, Bushings, Compressor Housing Bores, Piston Pin Holes, Connecting Rods, Valve Guides, Hydraulic Pump Bores, Rocker Arms, Ceramic Tubes, Valve Bodies.

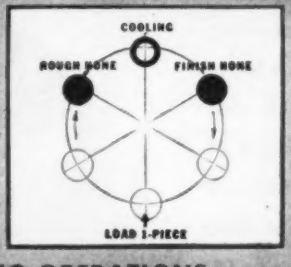
Variations in error which usually occur in production are corrected in straight run honing. Uniform size is automatically generated through the Micromatic Microsize Control—a positive, fully automatic method of generating uniform size.

Each spindle has its own individual Microsize Control, so that any desired combination in multiple or progressive honing may be set up.

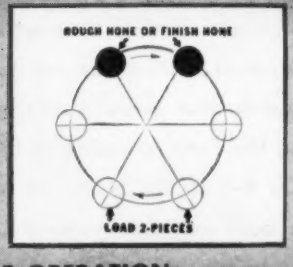
Three typical set ups are illustrated below:



THREE OPERATIONS. Progressive Honing Operations permit maximum stock removal per unit of time. Usually recommended for maximum stock removal ranging from .007 in ¼" diameter bores to .010 in 1" diameter bores.



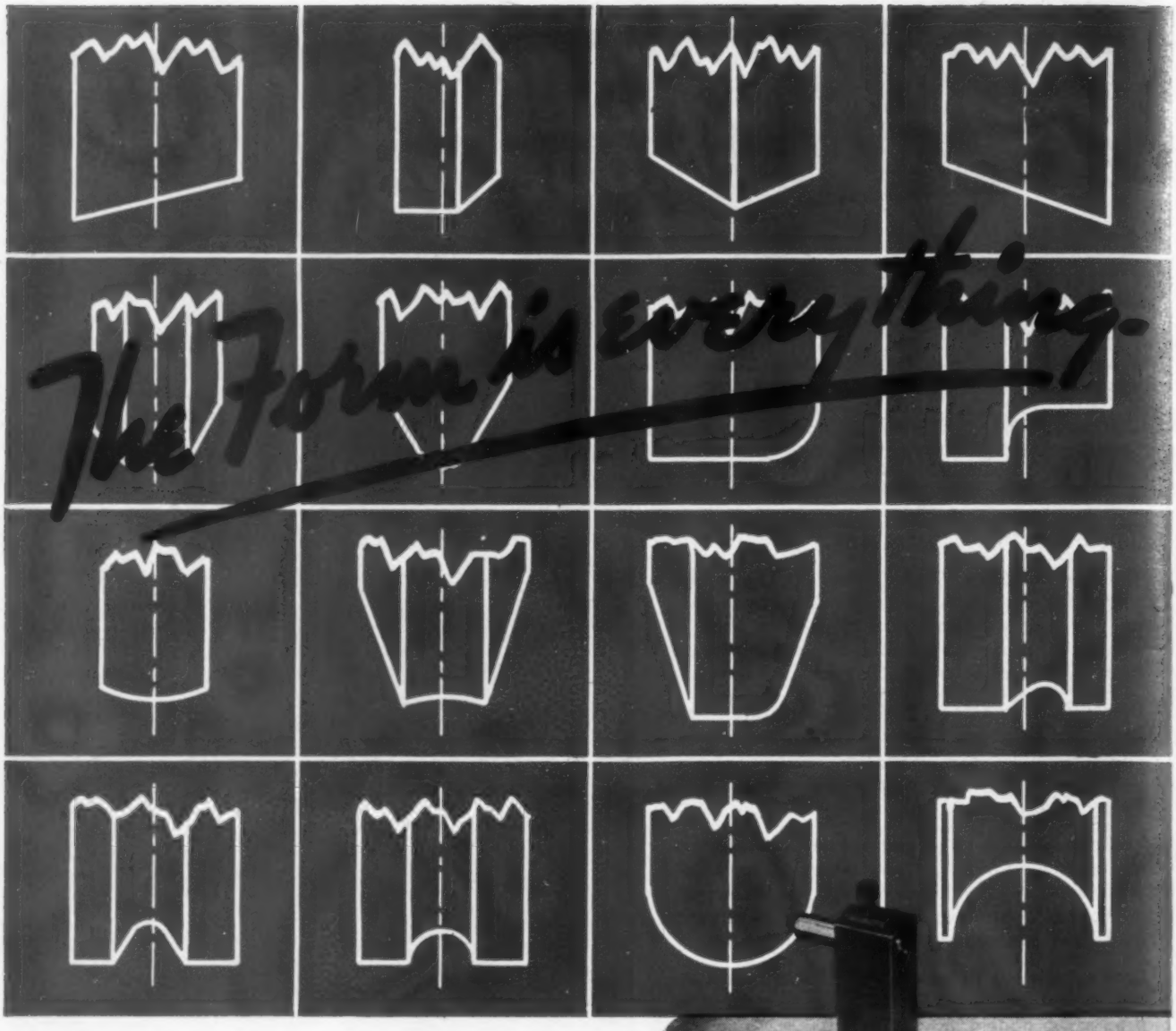
TWO OPERATIONS. Progressive Honing Operations permit medium amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0035 in ¼" diameter bores to .005 in 1" diameter bores.



ONE OPERATION. Multiple Honing Operation permits conventional amount of stock removal per unit of time. Usually recommended for maximum stock removal ranging from .0005 to .0015 for hardened parts (55 Rock. C or harder), .001 to .003 for soft or medium hard parts, in bores from ¼" to 2" diameter.

CHONE CORPORATION DETROIT 4, MICHIGAN

HONING MACHINE TOOLS



. . . and definitely so when applied to grinding-wheel forms. Dressing and repeating that form within an accuracy of .0001"—simple and rapid conversion to other jobs—eliminating time-wasting adjustments on the diamond post—these are items that can loom large in production costs. Reducing these costs and improving the form dressing is the prime object of the VINCO B-1 DRESSER (angle tangent to radius). Precision built—reliable year-in and year-out, and adaptable to nearly every type of grinder. Write for more detailed information.

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500% greater expansion range enables one Lempco Dual-Spiral to finish ream as many different size holes as 5 or 6 ordinary expansion reamers. Blades may be economically resharpened 8 to 10 times. New blades inserted in 30 seconds when needed. 1/2" to 3-3/32" sizes. Extensions and follow-pilots of different lengths for line reaming. Ideal for reaming over keyways, oil grooves, or any interrupted cut. Good delivery. Ceiling-priced.

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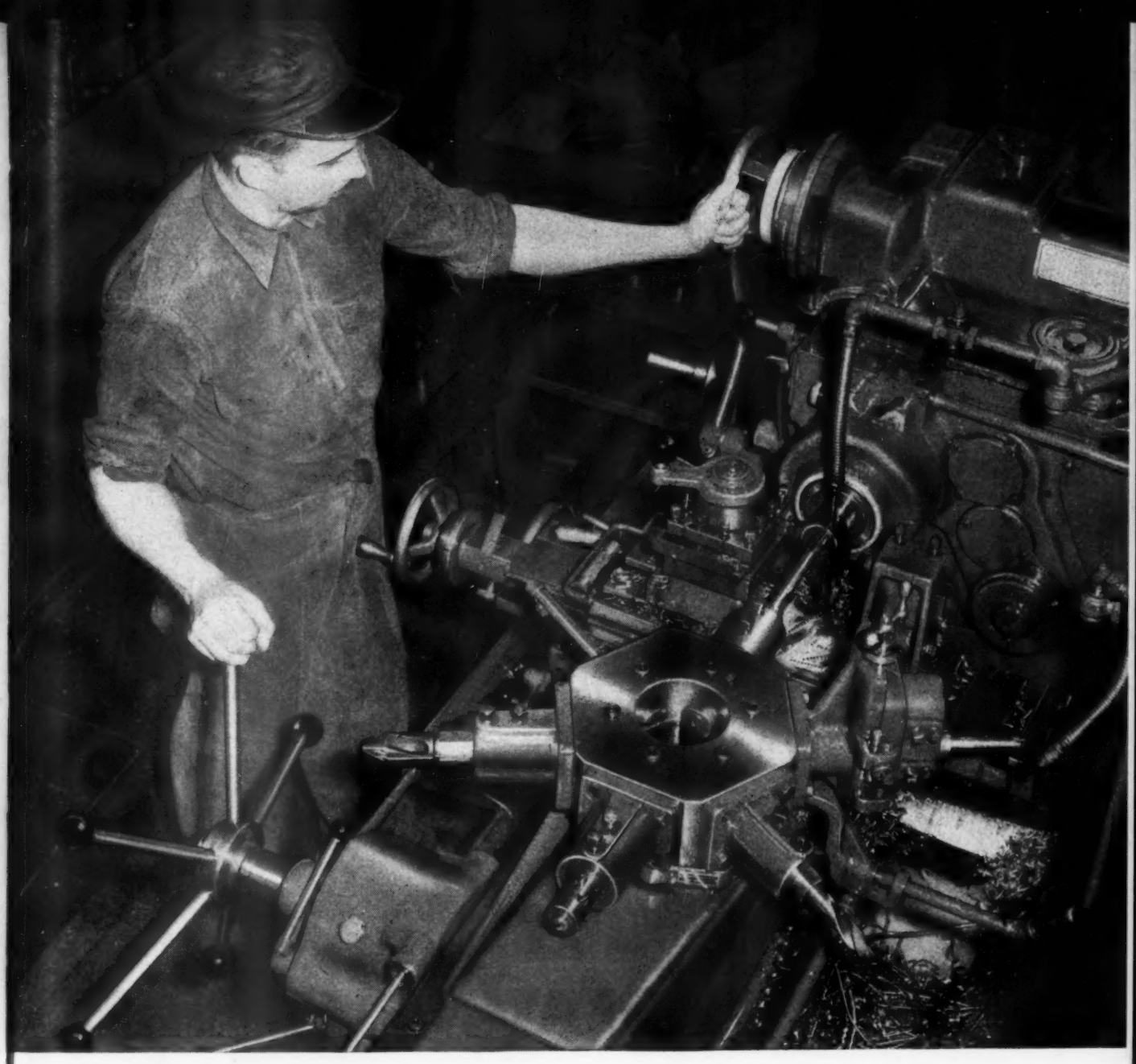
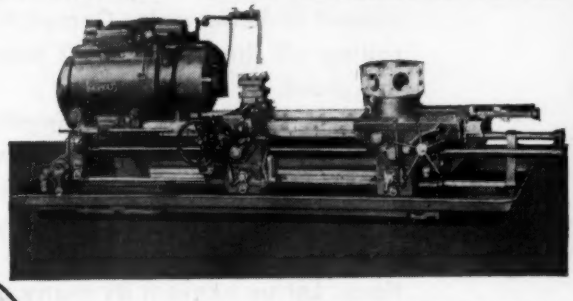


Natural Coordination FOR THE OPERATOR

Here's another good reason why operators prefer Gisholt Turret Lathes. They are easier to get "used to." All controls are within easy reach. For each machine function, the lever or wheel is exactly where it should be, so that the operator quickly finds it "second nature" to perform a series of operations in sequence . . . by natural reaction . . . like driving a car. *The machine is designed that way.*

Moreover, many of the machine functions are accomplished automatically or by power. The operator is relieved of many unnecessary motions. And he is relieved of fatigue, too.

It is another way in which Gisholt's 60-year leadership in design shows up in faster, easier production. Why not get all the facts?



GISHOLT SADDLE TYPE TURRET LATHES *provide power rapid traverse for the in-and-out motion of the square turret as well as for longitudinal travel of both turrets. If desirable, they may be equipped with cross-feeding hexagon turrets. Write for the Gisholt General Catalog.*

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● Since its introduction less than a year ago, the Udylite "Packaged" Full Automatic has won an "all out" acceptance.

Dozens of installations have been made and their performance has been almost unbelievable. Complete installations have been made and production rolling off the machine 72 hours after the machine arrived on a freight car at the plant.

There has never been anything like this new Full Automatic . . . compact, low in cost, easily movable, versatile in use, quickly convertible and standardized in size and construction, this machine represents one of the finest investments in finishing equipment you can make today.

Present owners say the Full Automatic has exceeded their greatest expectations. Let us explain its many unusual features to you—write for our illustrated bulletin.

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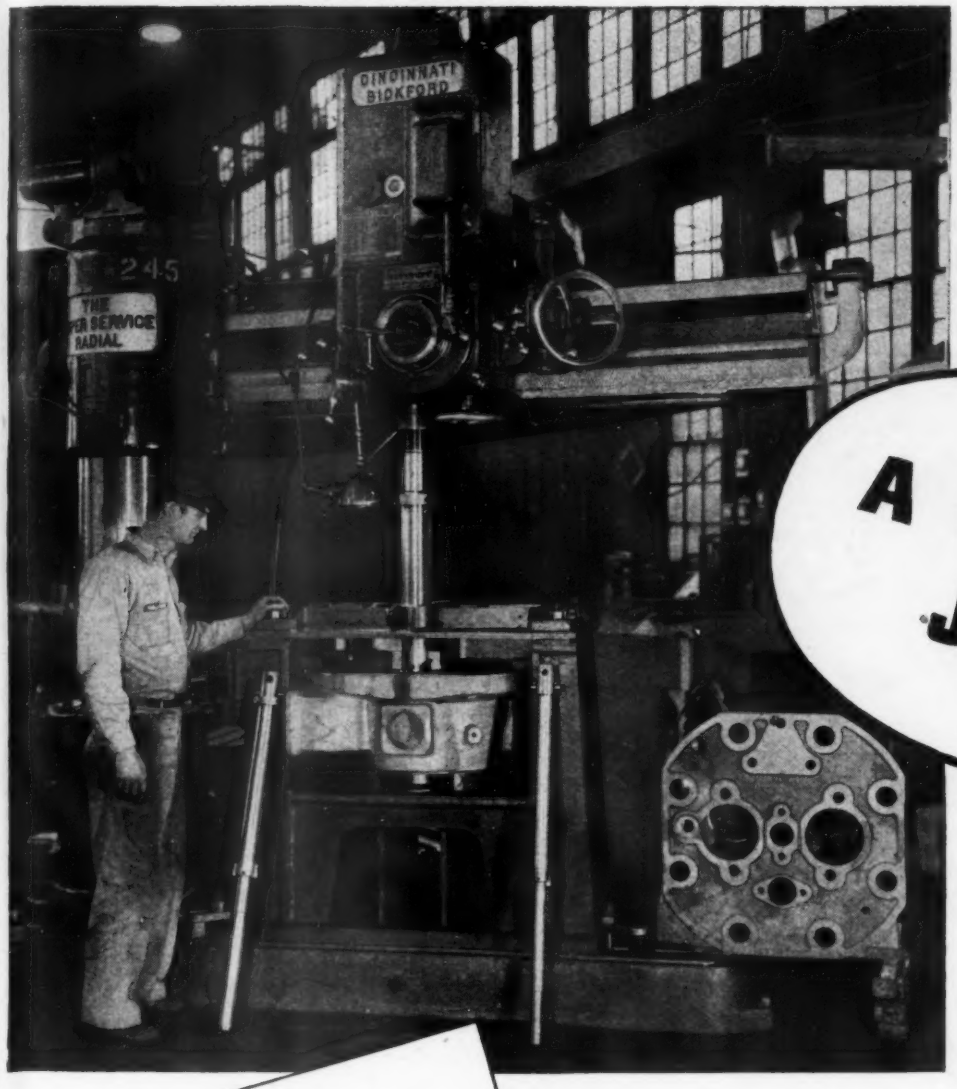

A FUSSY JOB

● The spindle driving gears are mounted on a continuous sleeve of special bronze alloy carried by precision anti-friction bearings. Herringbone gears are used for the final slow speed spindle drive for greater strength and smoother rolling action.

Equal Efficiency of Every Unit Makes the Balanced Machine.

● On these boring and drilling operations a smooth chatterless flow of power is necessary. The intelligent use of good tools and fixtures on this Cincinnati Bickford Super Service Radial—at work in the shops of The Fulton Iron Works Company of St. Louis—is another example of the productive and profitable performance of Cincinnati Bickford Radial Drills.

Write for Bulletin R-24-A

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. **Cincinnati 9, Ohio U.S.A.**

Precision Tapping

. . the Finishing Touch to a Perfect Part

THE Denison Engineering Company, Columbus, Ohio, makes a wide variety of aircraft parts. Cutting internal threads to Class 3 fit is usually the last of many precision machining operations on these beautifully-finished aluminum parts. A thread error at this stage means the loss of all previous time-taking operations through the scrapping of a costly piece.

Replacing old-type tapping machines with a new Warner & Swasey Precision Tapping and Threading Machine has resulted in an average time saving of 35%. On the particular operation, illustrated above, tapping a ⅛"-27 pipe thread in a Landing Gear Nose Body, Class 3 fit, with depth held to .010 accuracy, a Warner & Swasey No. 12 has increased production 100% over former method.

Very likely Warner & Swasey Precision Tapping and Threading Machines can show similar results for you. Your Warner & Swasey field man can explain how the patented principle of lead screw and solenoid actuated guide fingers can eliminate thread inaccuracies.

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Precision

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4 Models—Capacities 0-80 to 1½" in steel,—to 2½" in soft metals and plastics.

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TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—TAPPING AND THREADING MACHINES

Fair and Warmer

CATACLYSMIC events have struck the nation. First was the shockingly abrupt death of Mr. Roosevelt. Then came the virtual collapse of organized resistance in Germany and with it the end of an era of Nazi domination of Europe.

Ahead of us are three tasks, demanding the best from us. We must formulate an effective, just and lasting peace. We must win the war with Japan as speedily as possible. We must manage our industrial economy so as to give the armed services everything they need to finish the job in the Pacific and, at the same time, to begin the reconversion of our industrial facilities back to peacetime operations.

In effect, we are at the threshold of a new phase in our national life. Upon how well we accomplish our purpose will depend our success and our prosperity. The metal-working industries have a vital stake in the proceedings, since they represent between one-fourth and one-third of our entire industrial establishment.

For all practical purposes, the war production job is done. That is not to say that we haven't ahead of us a gigantic task that would tax the full resources of every other country in the world except ours. It is merely to indicate that we know what the job is, we are superbly organized for it, and we have the capacity, the materials and the manpower with which to do it.

By contrast, we haven't yet begun the reconversion program that from now on must dovetail with the military program. It provides the question mark in our economy.

The previous record of President Truman, particularly as revealed by the actions of the Truman Committee (now the Mead Committee), gives encouragement that he will see that both military and civilian requirements are kept in proper balance, rather than one profiting at the expense of the other.

Mr. Truman has repeatedly and continuously been a zealous guardian of the interests of all the people. He has realized that if the war is to be fought to a successful conclusion, a certain minimum standard of civilian needs must be maintained. If we fell below that standard, the war effort itself would be endangered. A breakdown on the home front inevitably brings unfavorable repercussions at the fighting front.

It is a fair assumption that the new President will deal vigorously and constructively with the problems of reconstruction and reconversion. Many of the top-flight administrators in our government have expressed their belief that wartime controls should be relaxed or abolished as quickly as possible. There is reason to believe, based on his statements as head of the Truman Committee, that Mr. Truman shares the same belief.

We obviously have reached the point in our national development at which business, industry and the government cannot operate completely independent of each other. The national interest bespeaks cooperation and a certain amount of inter-relationship. In this relationship, government can do much to help industry by giving the latter as much latitude as possible in which to act.

If industry is to live up to its postwar responsibilities, it must have a favorable climate in which to operate. A helpful friendly government is one of the necessary elements in that climate. As things begin to shape up, one may well risk the prediction that the weather forecast for the reconversion period will be fair and warmer.

Burnham Finney

MORRIS MOR-SPEED
Single Spindle Vertical Machine

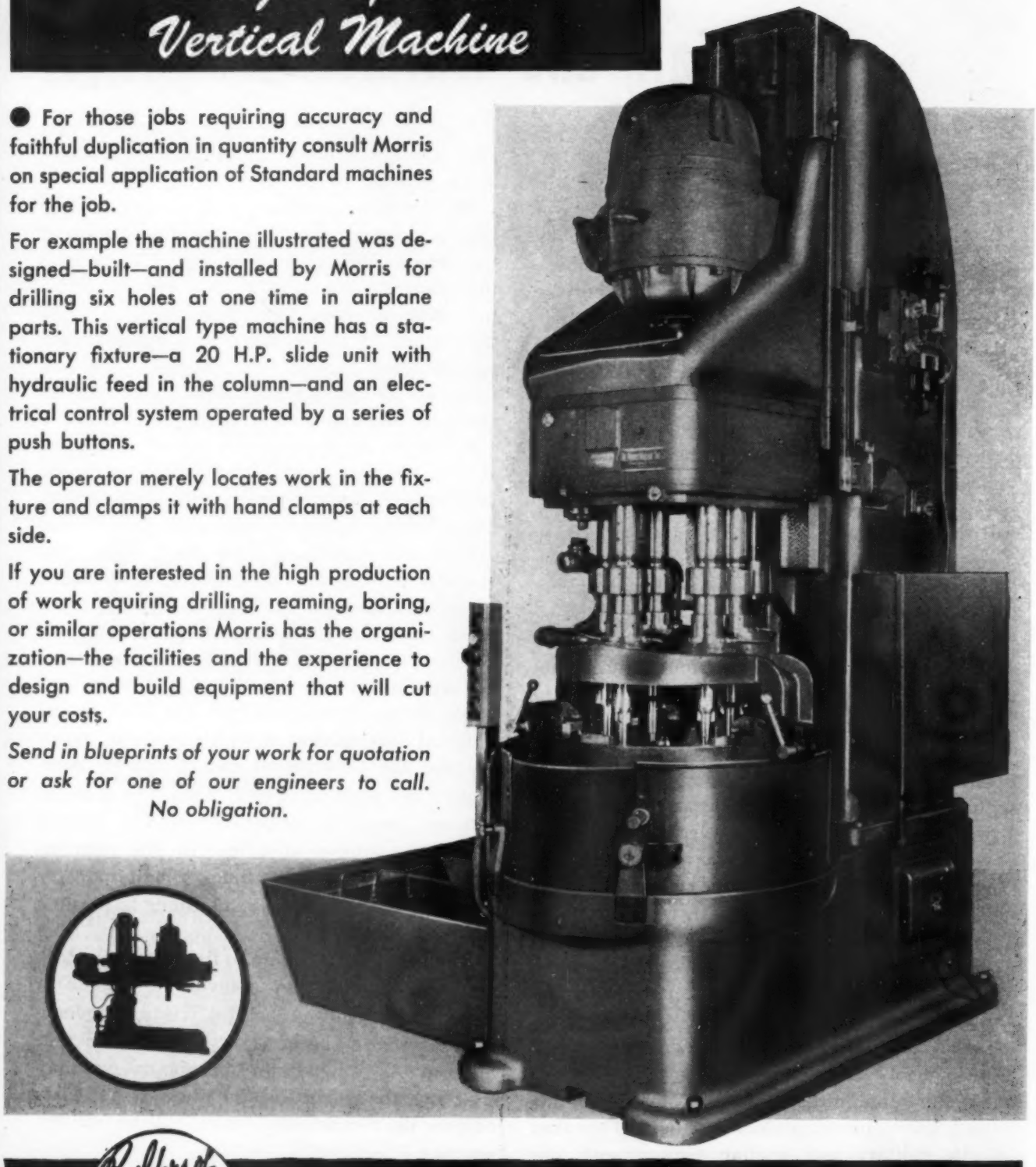
● For those jobs requiring accuracy and faithful duplication in quantity consult Morris on special application of Standard machines for the job.

For example the machine illustrated was designed—built—and installed by Morris for drilling six holes at one time in airplane parts. This vertical type machine has a stationary fixture—a 20 H.P. slide unit with hydraulic feed in the column—and an electrical control system operated by a series of push buttons.

The operator merely locates work in the fixture and clamps it with hand clamps at each side.

If you are interested in the high production of work requiring drilling, reaming, boring, or similar operations Morris has the organization—the facilities and the experience to design and build equipment that will cut your costs.

Send in blueprints of your work for quotation or ask for one of our engineers to call. No obligation.



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The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

Four Basic Types of Molds Used on Thermosetting Plastics

BY D. M. BUCHANAN, CHIEF DEVELOPMENT ENGINEER, THE BAKELITE CORPORATION

The different types of molds, the molding processes, and the considerations in their choice are presented in this article, one in a series on the subject

THERMOSETTING MATERIALS—phenolics and ureas—are usually molded by compression or by transfer molding, the latter an adaption of the injection molding process.

There are four types of compression molds: fully positive, landed positive, flash or overflow, and semi-positive. These classifications are based on the purpose for which the molds are best suited, their construction, and their action upon the material during the molding operation.

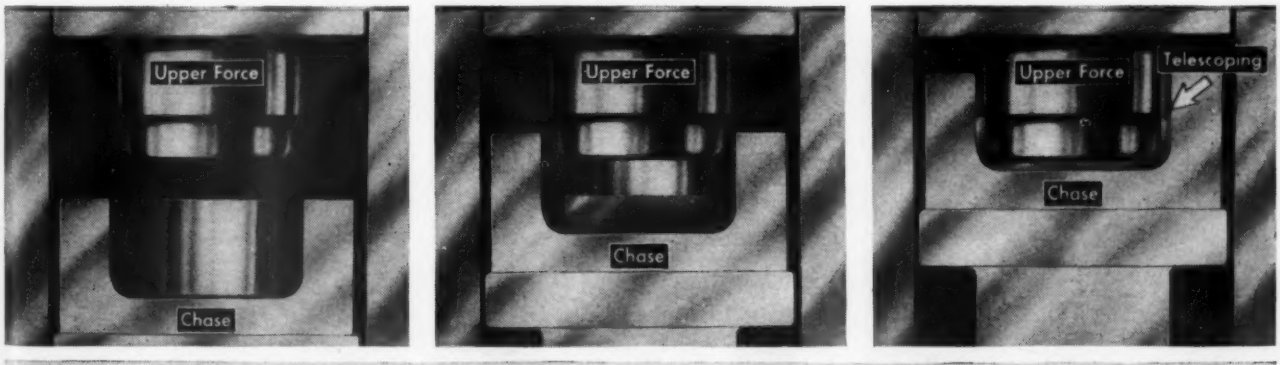
Fully positive molds are best suited for molding parts when maximum density and toughness are required. In this type, an upper force exerts the entire molding pressure directly on the material throughout the molding cycle. Toward the end of the stroke, the force telescopes into the chase, preventing the escape of excess material. The compressed material stops the travel of the chase, determining the height of the piece and the thickness of bottom sections. Therefore, the charge must be weighed accurately.

One variation of the fully positive mold has movable forces at both top and bottom. This design is used for "deep-drawn" parts having irregular sections at the bottom of the mold cavity and keeps the molding material in motion at all points while the mold is closing. As in the single-force positive mold the charge must be weighed accurately.

Landed-positive molds are used when greater uniformity of molded height and thickness are required. They are suited for a wide range of medium to "deep-drawn" parts.

In the external landed type, the depth of travel of the force is regulated at a predetermined point by outside lands which receive the full molding pressure. Their construction makes them particularly suitable for molding fabric-filled phenolics. Greater clearance between the mold members is provided, and excess material is squeezed out in vertical fins, thus permitting easy removal of flash.

Landed positive molds also can be constructed with the lands placed internally. They are used primarily to increase the cavity area or loading space for the molding material.



The simplest form of mold is the fully positive type and is used to produce parts of high density. Left — An upper force, or plunger, telescopes into the chase and traps the molding material. Center — The upper section of the force closely fits the chase and prevents escape of material. Right — The amount of the charge determines the point at which the force will stop, and hence must be accurately weighed

These molds should be used for free-flowing plastics, but not for the fabric-filled impact materials, which leave heavy flash on the horizontal lands, varying the thickness and density of the molded piece.

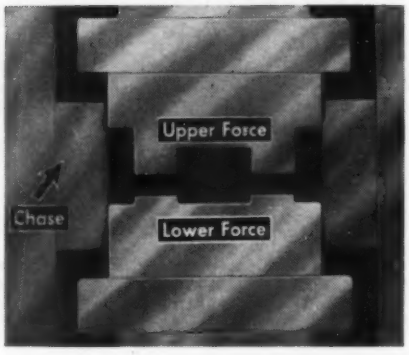
In both types or landed positive molds, it is advisable to use a slight excess of powder of preform weight to insure proper density of the piece.

Flash or overflow molds are usually the least expensive to build, and are generally used for molding parts of flat or shallow construction. Unlike the telescoping parts of positive molds, they are designed so that the mold halves are mounted to register exactly. The travel of the chase is stopped by small areas called flash ridges or cutoffs.

A flash mold is generally used for molding preformed urea or phenolic thermosetting plastics. A slight overcharge is used to insure sufficient back pressure to form a dense molded piece. This excess is squeezed out over the flash ridge. The molding pressure at the flash ridge reduces the thickness of the flash to a minimum. Flash or overflow construction is often used in multiple-cavity molds because it provides for variations in preform weight and equalizes pressure in the cavities.

Molds for Deep Sections

The semipositive mold is used for a wide range of medium to "deep-drawn" industrial parts, and is well suited for multiple-cavity molding. In this type of mold, flash ridges, telescoping parts and external lands are combined. It is used for both low and high density plastics. As the mold closes, the excess material escapes between the flash ridges, equalizing differences in weight of charges. The force then telescopes



A variation of the basic fully positive mold has two forces that advance in opposition. This construction is used for deep-drawn parts, and for pieces with intricate opposing faces. The use of two moving forces assures that the molding material will be kept in motion and will reach all depressions on the faces. Unless the material charges are weighed accurately, the thickness of the parts will vary

into the chase. It entraps and compresses the plastic, thus exerting a direct and full pressure on the material and assuring proper density of the part. When the mold is fully closed, the molding pressure is taken on the metal lands, and the clearance between the flash ridges regulates the thickness of the flash.

Sometimes the design of a part makes it impractical or impossible to use the compression method. Complicated parts with many inserts or with inserts placed at an angle usually fall in this class. Then the pressure of hard, unsoftened plastic would move inserts from their supports, bending or shearing complicated pins. This difficulty is avoided by injecting fluid plastic into the closed cavity. This method is known as transfer molding, a form of injection molding applied to the customary thermosetting compounds.

Transfer molding is used for molding parts that have thin or fragile inserts. It eliminates gas pockets and assures close dimensional tolerances and uniform density of the molded piece. This method will be discussed in detail in a forthcoming number.

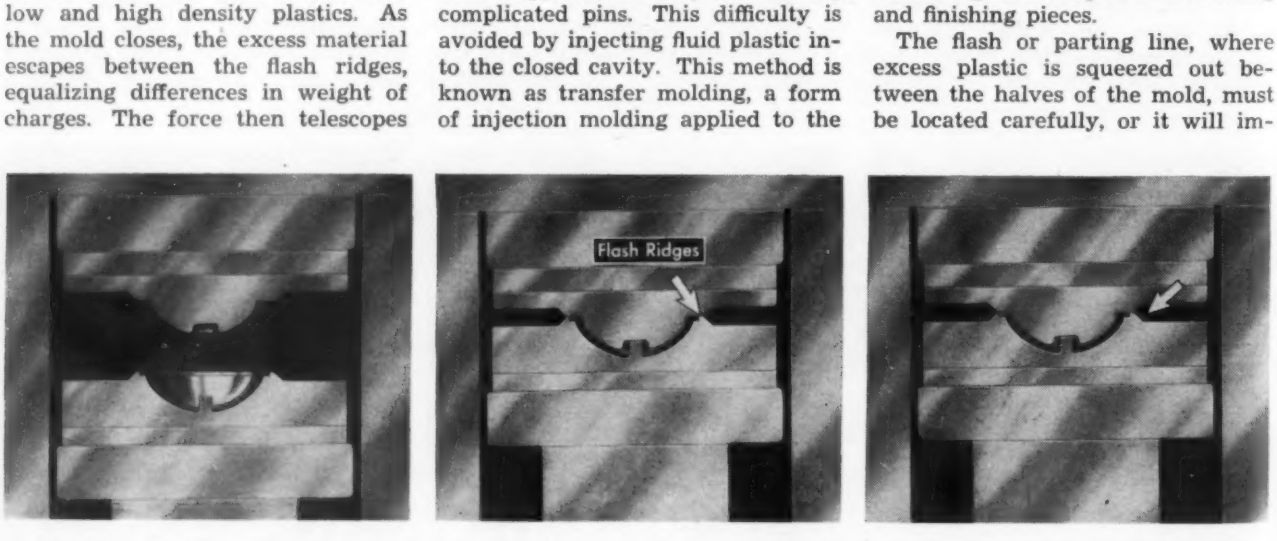
Considerations for Undercuts

When undercuts form the outside contours of the piece—termed external undercuts—it is possible to design a mold around it. The cavities are built in two or more loose members. These are tightly retained in a chase block while a force plug applies the molding pressure. When the part is molded, the force is removed first, then the chase block and the loose members are parted, permitting easy removal of the molded piece.

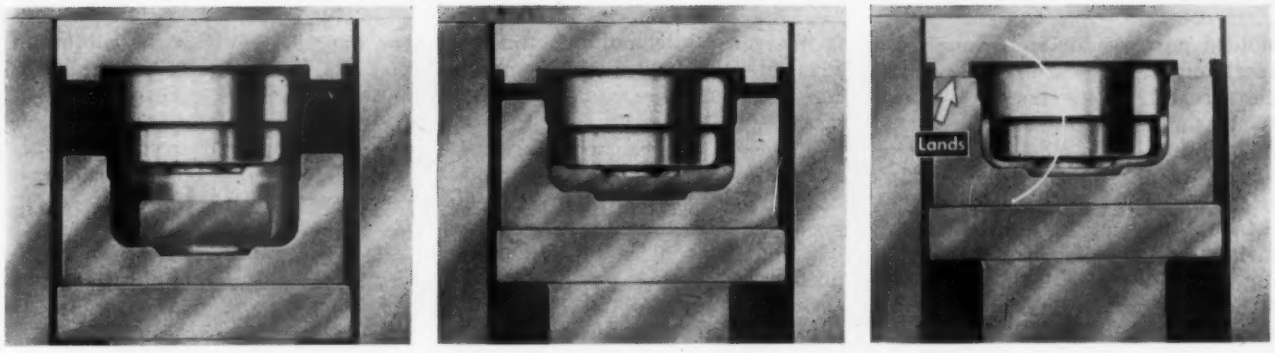
The part also may be molded in an angle press without loose mold members. The stationary part forms half of the cavity. A horizontal ram moves in the other half of the mold to form the cavity. A vertical ram moves down a force plug to apply the molding pressure. Withdrawal of the vertical and horizontal rams releases the molded part and permits its removal.

When undercuts form the inside contours of a molded part, they are termed internal undercuts. The part can be removed from the chase, but not from the force. It is possible to produce a force plug with loose sections for most types of parts with internal undercuts, but this usually leads to greater expense in molding and finishing pieces.

The flash or parting line, where excess plastic is squeezed out between the halves of the mold, must be located carefully, or it will im-



Flash type molds have no telescoping faces on the force plug and chase. The force is provided with a flat that extends around the force plug. The chase is built with a projecting ledge, called a flash ridge, that extends above the chase. Left—The force advances on the chase until the flat on the force lands on the flash ridge. Center—This causes the overflow of excess material, that must escape over the surrounding flash ridge, to be compressed and cut off. Right—The charge for the flash mold requires an excess of material



The landed positive-type mold is equipped with extended faces that contact when full closure has been reached and maintain a constant dimension for the molded parts. The telescoping face of the force has ample clearance to permit excess material to flow past. The material trapped between the telescoping faces is a very thin flash and easily removed. The charge for this type mold provides an excess for flash removal

pair the appearance of the finished molded part. The flash line usually is best placed at the maximum diameter or area of the part, and on a single plane. In compression molding, thickness of the flash can be kept to a minimum by fitting and supporting the mold members accurately to permit easy removal of the flash on flat belt sanders. When flash does not exceed 0.003 in. in thickness, as on parts produced in flash or semipositive molds, it can be removed easily in tumbling barrels. This method is commonly used for finishing such products as bottle caps, buttons, handles, knobs and electric wiring devices. Round parts are defined quickly and trued to size on a bench lathe. Frequently parts of irregular contour must be finished with a hand file, or with a buffing wheel.

Removing the Finished Part

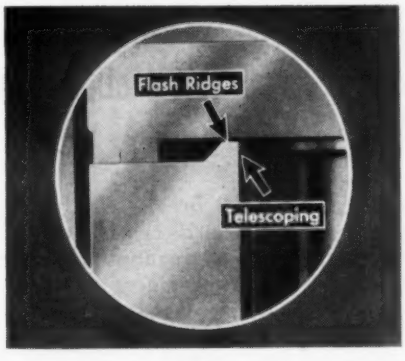
Provision for easy removal of the part from the mold by the proper allowance of inside and outside draft or taper is an important consideration. Microscopic irregularities in the mold surface, which are reproduced in the part, make it difficult to withdraw the molded piece from a cavity with vertical walls.

A highly polished mold assists greatly in the release of the part. The part is easily released when the walls are tapered. When correctly designed, the sidewall is thickest at the bottom of the part. In molding, the plastic flows between the tapered sidewalls of the mold and the density of the plastic is increased due to the wedging action of the tapers. This is especially important in deep-drawn parts.

Through holes are easier to produce than blind holes, because the mold pins can be supported on each side. Every blind hole requires a mold pin supported at only one end and the pin may be sheared off if it is too small in diameter.

Depth of a blind hole can be safely calculated at twice the diameter, and when a hole is 1/16 in. or less in diameter, its length should not exceed its diameter. Through holes may be molded either with a single pin supported at both ends, or by two pins butted together. One pin should be slightly larger than the other, to allow for minor misalignments during molding. The ends of the pins must be ground flat, or a thin flash may occur. However, this flash, if permitted to occur, is easily removed.

Sufficient wall thickness must be allowed between holes to take care of shrinkage and prevent cracking later. A safe minimum is 3/32 in. The outside section around any hole should be at least half the diameter of the hole.



The construction of the semipositive type mold combines flash ridges, telescoping parts and lands. The flash ridges do not contact the force because the travel is stopped by the lands. The material is permitted to escape over the ridges until the telescoping section of the force enters the chase. This permits an excess of material to be placed in the mold and, as the excess escapes, each part will have the proper density. Full closure of the mold places part of the pressure on the lands and stops the travel.

Molding Inserts

When a number of small tapped holes is required, it is desirable to mold the hole with a countersunk edge and machine tap the threads. The molded countersink prevents the top surface from cracking during the tapping operation.

When assembling molded covers using small flathead screws, the countersunk hole should be molded with a recessed counterbore of 1/64 in. depth.

Side or oblique holes are hard to mold by the compression method, as the pins may be bent or distorted, resulting in misalignment and difficulty of removal. This may be avoided by using the transfer molding method.

It is frequently less expensive to drill holes after molding, particularly side or oblique holes. This reduces mold costs and molding time, including time lost in replacing damaged core pins.

Embedded inserts are used in molded parts to facilitate assembly of component pieces. Dimensions of inserts should be held to close tolerances so that they will fit snugly in the heated mold and therefore will not dislodge during the molding cycle. Also, they should preferably be positioned vertically.

Standard screws should not be used as inserts because the sharp corners at the head cause strains and may result in cracking of the molded piece. Special screws with knurled heads are preferable. Inserts with internal threads should not be placed flush with the surface of the

molded part, as during the molding operation the plastic may flow into the threads, which must be cleaned out by tapping. This can be prevented by providing a recess around the top of the insert above the surface of the plastic.

In building molds, allowances for shrinkage of the plastic during molding must be calculated carefully. Depending on the type of filler and resin, each material has a definite shrinkage. While molding, the material fills the cavity, and upon curing and removal from the mold, shrinks to the desired size. Production tolerances can be determined more accurately for dimensions perpendicular to the direction of molding pressure than for dimensions parallel to the direction of molding pressure.

On perpendicular dimensions, tolerances of plus or minus 0.002 in. per inch of depth is the minimum that can be maintained but plus or minus 0.005 in. is more practical.

On parallel dimensions, plus or minus 0.005 in. per inch is the ultimate, but plus or minus 0.008 in. is more workable.

The principles of transfer molding, together with applications and limitations, will be discussed in an early number.

Acid Solution Removes Cutting Tips

BY R. G. MAURER AND E. F. DAVIS
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

A PROPERLY controlled solution of nitric acid and water has been found effective in removing copper-brazed carbide cutting tips from tool shanks. The solution does not damage the shank material and invariably the shanks do not have to be remachined for retipping.

Formerly the tips were removed by heating the tool to a copper-brazing temperature of 2,050 F. Repeated heating, however, caused grain growth to a point that the impact strength of the shank steel was reduced to about 60 percent of the initial strength. Furthermore, unless the procedure was carried out in a non-scaling atmosphere, the shanks usually required machining before being retipped.

If torch or induction heating is used for removal of copper-brazed tips, a small particle of tungsten-carbide generally adheres to the recess. Efforts to remove this particle often destroys the recess.

The new method involves a solution of 8 to 9 percent nitric acid (HNO) and 10 to 20 percent water. The solution should be maintained at a temperature between 176 and 194 F. Higher temperatures cause attacks on the shank material, and lower temperatures delay the removal operation needlessly. A minimum volume of 100 milliliters per tool of average size is satisfactory. The following procedure is recommended:

1. Cold tools should not be immersed in hot acid because violent foaming and boiling occurs. They should be heated in water or in the solution to the operating temperature.

2. Position tools so that tips can drop out when the joint has been dissolved. If the tools are removed from the solution for inspection, they should be immersed in hot water before being returned to the solution.

3. Only the tip should be immersed as the reaction will then be concentrated at the joint, avoiding undue contamination.

4. Three sets of tips can be removed with the same solution, although the third set will require a longer operation period. Large tools require about 1½ hr. and smaller tools about 30 min.

5. After removal of the tips, wash the shanks in hot water and dry thoroughly.

6. Safety precautions include use of gloves and aprons impervious to the acid; wearing goggles; use of a hood with forced draft to dissipate the acid fumes; provision for heavy Pyrex containers; and presence of a neutralizing solution.

Why Break Small Drills? This Method Suggests a Way Out

BY RAYMOND P. WIGGERS

SMALL DRILLS break readily for two reasons; the drill is too long for its diameter and cannot support heavy feeding pressures without buckling, and its cross-sectional area is too small to resist twisting due to excessive chip loads.

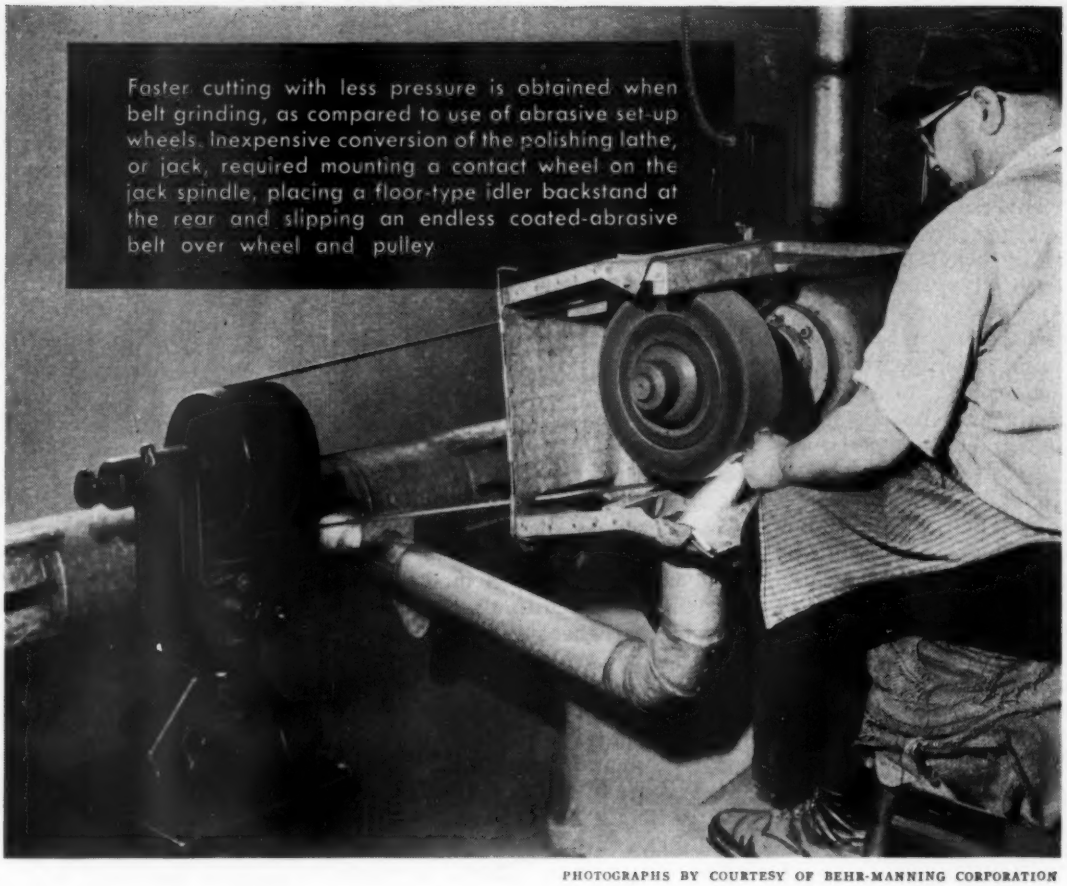
When drills are used in a lathe, the practice is to mount the drill chuck in the tailstock and feed the drill by using the handwheel. The handwheel is too large in comparison to the drill, the "feel" is missing —it is too insensitive to the drill resistance, "finger tip control" is not there.

It is possible to minimize breakage by using two drill chucks. The one for holding the drill must have a round shank, and the other a taper shank. The taper shank chuck is mounted in the tailstock spindle firmly, or a trifle tight. The small drill is gripped in the jaws of the straight shank chuck.

The method of operation is to run out the tailstock spindle until the drill almost touches the work, then feed the straight shank chuck by fingers. Any unusual resistance can be relieved at once, or the drill can be backed out to free it of chips.

If a large number of small holes are to be drilled, a special tailstock adapter will be advantageous. A hole large enough to take the straight shank can be machined in it and the outside is tapered.

With this combination, small drills ranging from number 80 and upward can be used. Deeper holes are made possible than by any other method. If a mechanical feed is used, the feeding rate is difficult to judge, nor can you tell when chips fill the flutes.



Faster cutting with less pressure is obtained when belt grinding, as compared to use of abrasive set-up wheels. Inexpensive conversion of the polishing lathe, or jack, required mounting a contact wheel on the jack spindle, placing a floor-type idler backstand at the rear and slipping an endless coated-abrasive belt over wheel and pulley

PHOTOGRAPHS BY COURTESY OF BEHR-MANNING CORPORATION

Polishing Jacks Can Be Converted To Efficient Belt Grinders

BY RUPERT LE GRAND, ASSOCIATE EDITOR, AMERICAN MACHINIST

PRODUCTION INCREASES of several hundred percent are not uncommon in plants that have converted polishing jacks and bench grinders to belt grinders. The changes involved are simple: In the case of a polishing jack, the abrasive set-up wheel is replaced with a suitable contact wheel, a backstand with idler pulley is provided, and a coated abrasive belt is fitted over the contact wheel and the idler pulley. Cost of the conversion is nominal: Approximately $150 for a floor-type conversion, $45 or less for a bench type. Add from $20 to $30 for the contact wheel. Bench grinders are converted by replacing the grinding wheel with a recessed contact wheel, installing a bench backstand idler pulley and fitting an abrasive belt over the contact wheel and idler.

Belt grinding and polishing are

For many years, grinding and polishing rooms have wrestled with the problems imposed by the abrasive set-up wheel. Now a few inexpensive accessories permit better and faster work

used for roughing and finishing an endless variety of products. Surfaces, corners, contours and welds on castings, forgings, sheet-metal products can be finished either by pressing the piece: (1) against the contact wheel, (2) upon the unsupported portion of the belt between pulleys, or (3) upon a section of belt supported by a platen or table, but this is usually done on bench-type equipment only. Sometimes the belt is placed vertically or at an angle, so that a fixture can be used to present a specific work surface to the belt in angular relationship to another work surface. Thus, set-ups on milling machines or surface grinders can

often be avoided, permitting these machines to be used for more important tasks.

Makers of hardware, projectiles, welded shell cases, furniture, and tools, to mention only a few, have found that labor and floorspace can be released to more productive purposes by conversion of polishing jacks to belt grinders. In making abrasive set-up wheels, the cloth wheel is coated with glue and rolled in the selected grain, after which it is dried. The handling and preparing of glues requires considerable care. Most of the trouble in polishing rooms arises from unsatisfactory glue or gluing practices. Poor work, irregular production, variable costs occur when glue is improperly chosen and applied. Considerable space is required for gluing, drying and storage operations, and a large stock of wheels must be kept on hand to satisfy varying work requirements. Besides, set-up wheels must be balanced and then "broken in" to get correct cutting action.

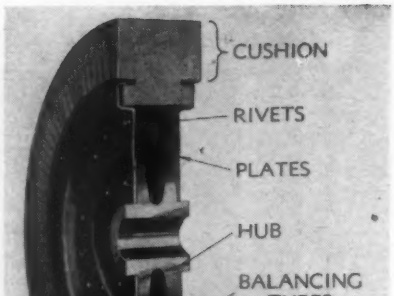
Grain Properly Oriented

The coated abrasives, on the other hand, are manufactured under scientific controls. In an automatic machine, the cloth backing is first coated to a uniform depth with glue. Then it passes to a grain-applying station. Here a strong electrostatic field energizes the grain spread upon a moving belt, causing the crystals to rise up to the glue-coated surface where they embed themselves in the glue. Chief advantage of the process is that the grains orient themselves so that the sharp points face outward, in contrast to the conglomerate arrangement of abrasive grain on the surface of a set-up wheel. After uniform drying, the coated-abrasive cloth is cut into strips, and the strips cut to the proper length for joining into belts, which are free-running and operate smoothly. Belts are thus stock items, available in many grits, widths and lengths. When a job requires the use of more than one grit, it is the work of but a few minutes to change belts and complete the batch of parts.

Better Finish Obtained

Cutting action of set-up wheels and abrasive belts can be compared on these counts: (1) speed, (2) coolness, (3) life, and (4) improved finish. Assume a polishing jack operating at 1800 r.p.m. and mounting a 14 in. diameter by 4 in. face set-up wheel. The cutting speed is 6600 s.f.p.m., the wheel area is 176 sq. in. And a single grain contacts the work 30 times per second. If the set-up wheel is replaced with a contact wheel of the same diameter, and an 11 ft. belt of 4 in. width is operated over an idler backstand, the belt will cut at the same rate but will make only 618 complete revolutions per minute. Thus, a single grain on the belt will strike the work only ten times per second. In a given time, the grain on the set-up wheel must do three times as much work as the grain on the abrasive belt.

The spreading of the cutting action over a greater surface area reduces the amount of work each grain must do, diffuses the heat, and gives a greater chance for heat to be dissipated. Heat is one of the worst enemies of finishing and polishing. It will cause an abrasive cutting surface to load or glaze excessively. As soon as a cutting surface glazes, it ceases to cut and instead burnishes the work. This gives rise to excessive frictional heat that may burn, discolor or distort the work—faults that constitute one of the greatest problems in finishing operations. So the belt runs cooler than the wheel for two reasons: individual grains do much less work, the belt has more surface from which to dissipate heat to the atmosphere. The work need not be held against the belt with as much pressure as against a set-up wheel; a circumstance which is appreciated by women operators.



Contact wheels are available in various densities, so that the desired degree of resiliency, or cushioning effect, is secured for the grinding or polishing action desired

Longer life of the coated-abrasive belt, as compared with the set-up wheel, therefore arises from improved cutting action, method of manufacture and greater area of cutting surface. Better finish on the work can be expected because of the uniform distribution of the abrasive particles on the belt.

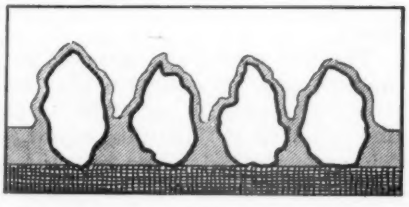
Grit selection depends on the work to be done and how much the user wishes to spend to secure the desired finish on his work. He may use any or all of these operations: for stock removal or roughing: aluminum-oxide grits Nos. 24, 30 or 36 at an optimum cutting speed of 4500 s.f.p.m.; for semi-finishing—grits Nos. 40, 50 or 60 at an optimum cutting speed of 5500 s.f.p.m., and for finishing—usually grits Nos. 80, 100 or 120 at an optimum cutting speed

Usefulness of bench grinders is extended by conversion to abrasive belt grinding, and constant cutting speed is secured as compared to a wheel which has been reduced several inches in diameter by dressing

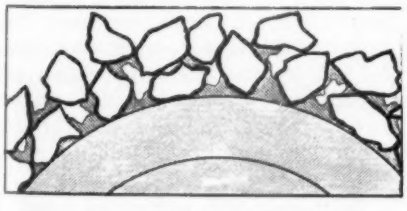
of 6500 s.f.p.m., although grits up to No. 320 can be used if the finish demands. In other words, maximum stock removal is secured at lower speeds and with coarse grits; better finishes at higher speeds and with finer grits. No hard and fast recommendations can be offered for grits and cutting speeds required to finish various materials.

Polishing lathes, or jacks, are built in constant- and variable-speed, single- and double-spindle models. These may be converted to belt grinding operations by installation of wall or floor-type backstand idlers. The wall-type idler is used when space does not permit use of the floor type, or where it is desirable to have the abrasive belt operate in an inclined or vertical plane.

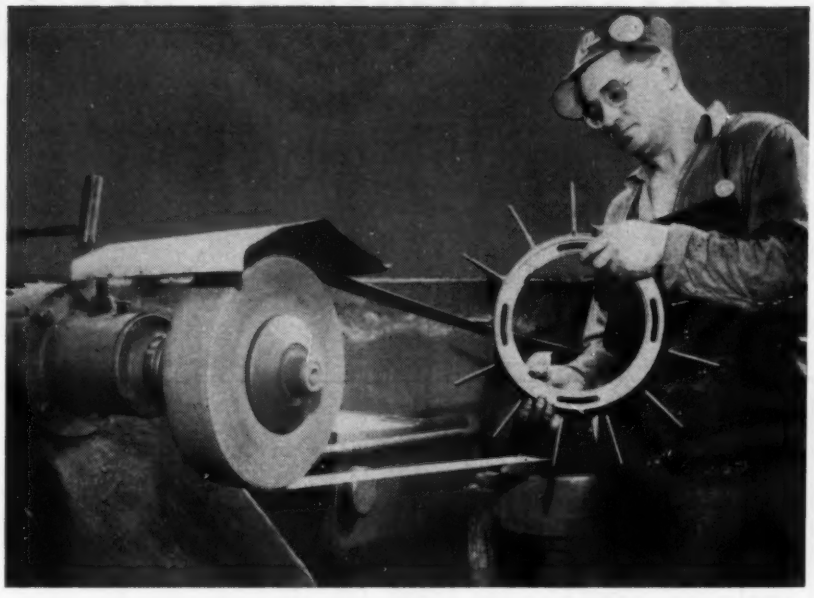
Floor-type backstand idlers are more common. They are usually placed far enough behind the polishing jack so that an 11 to 14 ft. belt can be used. The idler pulley diameter can range from 6 to 12 in. diameter, and the pulley face width should be from 4 to 6 in. to accommodate belts from 3 to 4 in. wide. The 4 in. belt width is standard. Means should be provided in the backstand to apply sufficient tension to the abrasive belt so that it operates freely over the pulleys but does not slip. Premature belt wear arises from slippage. An adjustment feature for tracking, whereby the belt runs over the centers of both pulleys, is also essential.



Electrostatic deposition of abrasive grain upon manufactured coated-abrasive cloth causes individual grains to embed themselves upright in the glue so that sharp points are presented to the work



When a set-up wheel is rolled in loose grain, the crystals take haphazard positions, there may be air pockets in the glue and poor anchoring of the abrasive grain



For many polishing and grinding operations, the unsupported section of the belt permits the operator to reach surfaces which he cannot apply to the contact wheel on the polishing-jack spindle

Power requirements depend upon the type of work being done, and whether one or two spindles are used. In general, a minimum of 2½ hp. is required for the average abrasive grinding or polishing operation. Therefore, a double-spindle lathe operating two backstand idler pulleys should have at least a 5-hp. motor. However, where heavy-duty grinding or combined abrasive-belt and rag-wheel operations are contemplated, it is best to use a 7½ to 10 hp. motor. Driving sheaves on the machine must often be changed to secure the proper cutting speed for the coated abrasive belt, considering the diameter of the contact wheel used.

Bench-Grinder Conversions

Bench grinders offer many possibilities for conversion to belt grinders, and thereby extend their usefulness. There are over 500,000 bench grinders now in use having motors of ½ hp. or more. A study of the products of 20 grinder manufacturing discloses that the following standards apply as to power, spindle diameters and speed: ½ hp., ⅝-in. spindle, 3600 r.p.m and ¾ or 1 hp., ¾ or ⅞ in. spindle, 1750 r.p.m. These machines can be converted by installing a bench backstand idler pulley directly behind the machine. A recessed contact wheel is required, because the spindle is not long enough for an ordinary contact wheel to clear the grinder housing.

Contact wheels are made usually of compressed canvas and sometimes of leather. Densities of the wheel face range from soft to hard in a number of steps so that the proper cushioning effect can be obtained for the operation in hand. Such wheels are limited to a speed of 7500 s.f.p.m. Most conversions to belt grinders have dealt with production of flat surfaces.

Enough is known about industrial requirements in respect to these conversions that standard stock sizes have been set up for coated-abrasive belts and contact wheels. These stock sizes are:

For polishing jack conversions:

Contact wheel diameters—12 and 14 in.

Belt lengths—132, 138, 148 and 168 in.

Belt width—2, 3 and 4 in.

For bench grinder conversions:

Contact wheel diameters—6 and 8 in. (depending on motor hp.).

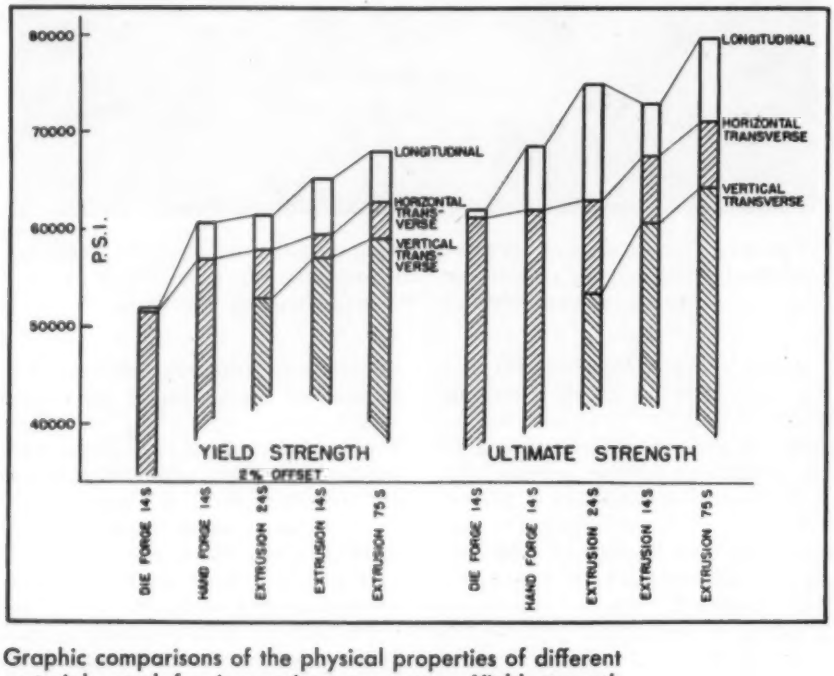
Belt lengths—48 and 60 in.

Belt width—2½ in.

When the program of converting polishing jacks and bench grinders to belt grinding and polishing operations was started, it was with the idea of showing war plants how to get more production out of existing equipment. It was recognized, of course, that there are many well-engineered belt grinders on the market. However, there are thousands of machines which can be still converted to off-hand grinding work. And appropriate fixture designs will make many of these converted machines still more useful.

Large Extrusions Replace Forgings In Making Inner-Wing Spar Caps

BY J. W. REIS, JR., METALLURGICAL ENGINEER, NORTHROP AIRCRAFT, INC.



Graphic comparisons of the physical properties of different materials used for inner-wing spar caps. Yield strength and ultimate strength of 75S extrusions top the list

MECHANICAL PROPERTIES OF FRONT UPPER INNER-WING SPAR CAPS

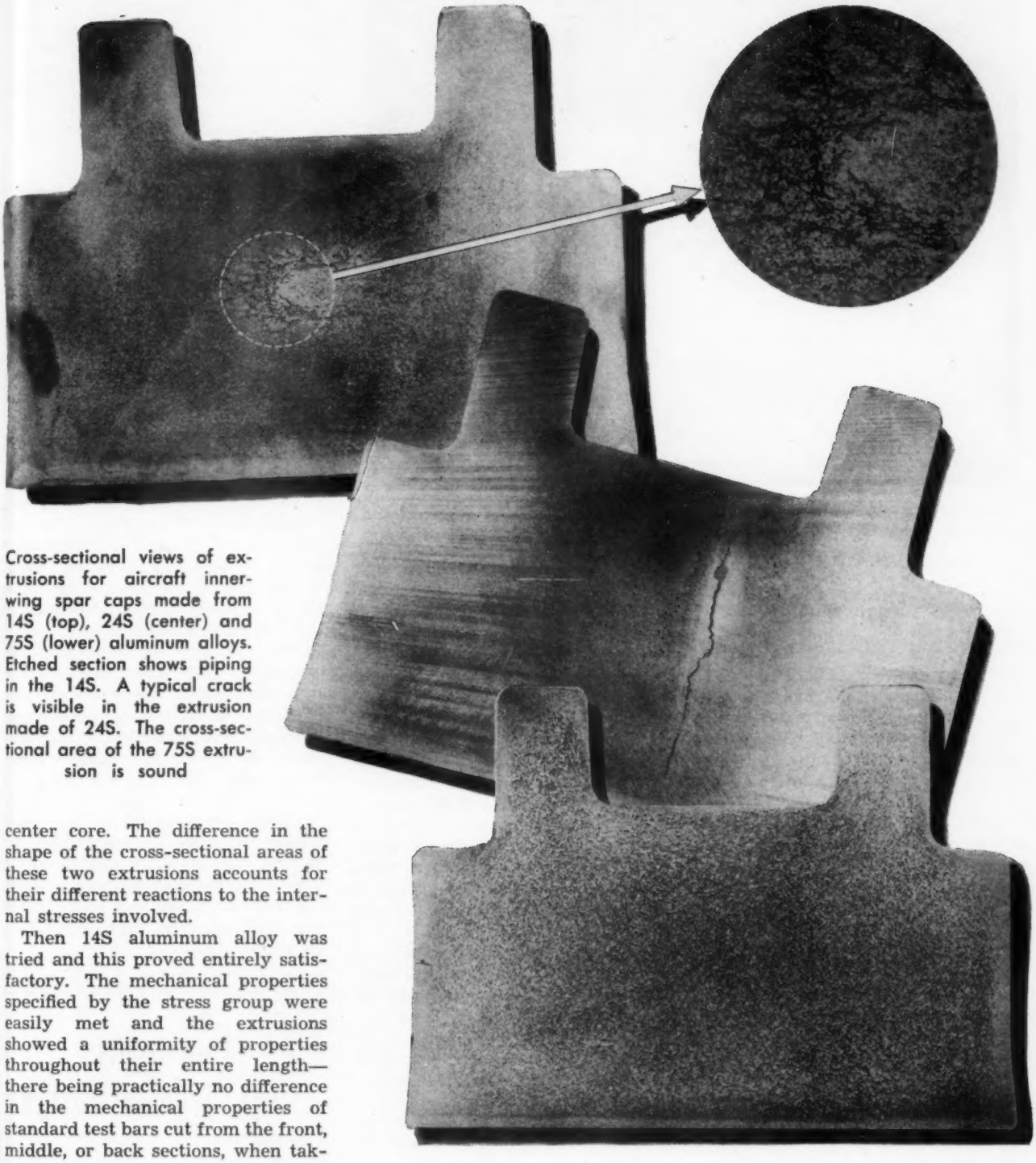
LONGITUDINAL MECHANICAL PROPERTIES	YIELD STRENGTH 2 PERCENT OFFSET	ULTIMATE STRENGTH	ELONG. PERCENT IN 2 IN.
14S Die Forging	51,370	61,900	12.0
14S Hand Forging	60,750	68,150	12.0
24S Extrusion	61,325	74,570	8.6
14S Extrusion	65,030	72,885	11.0
75S Extrusion	68,090	79,460	11.7
HORIZONTAL TRANSVERSE MECHANICAL PROPERTIES			
14S Die Forging	51,910	61,070	5.7
14S Hand Forging	56,730	61,970	2.8
24S Extrusion	57,870	62,230	1.7
14S Extrusion	59,310	64,485	2.7
75S Extrusion	62,230	70,970	4.2
VERTICAL TRANSVERSE MECHANICAL PROPERTIES			
24S Extrusion	52,200	53,530	0.5
14S Extrusion	56,930	60,470	1.8
75S Extrusion	58,770	64,030	1.8

In tests with various aluminum alloys, it was found that 75S gave the greatest strength. A close metallurgical control is kept over the large extrusions

ONE OF THE new developments at Northrop is the use of large extrusions for the fabrication of the inner-wing spar caps on the P-61, "Black Widow," night fighter. To do this required extrusions far larger than any ever previously produced, the front upper spar cap necessitating an extrusion having a cross-sectional area of 32.09 sq. in. and the front lower cap 26.54 sq. in.; both having a minimum over-all length of 116 in. Bohn Aluminum & Brass Company agreed to cooperate, and made the necessary dies and the first extrusions at their Adrian, Mich., plant.

The first alloy used was 24S aluminum, which was heat-treated and artificially aged in an effort to get the required mechanical properties. This material proved to be entirely unsatisfactory. While the longitudinal mechanical properties averaged as high, or higher, than those of the die and hand forgings then in use, the transverse properties were low and very inconsistent, especially in yield strength and elongation. Internal stresses of such magnitude were set up, during the extruding and subsequent heat-treatment, that many of the larger extrusions—used for making the front upper spar cap—contained large internal cracks, two to three inches high, running longitudinally throughout their entire length.

In the smaller extrusion, used in making the front lower spar caps, these internal stresses manifested themselves as a large number of shrinkage cracks radiating from a



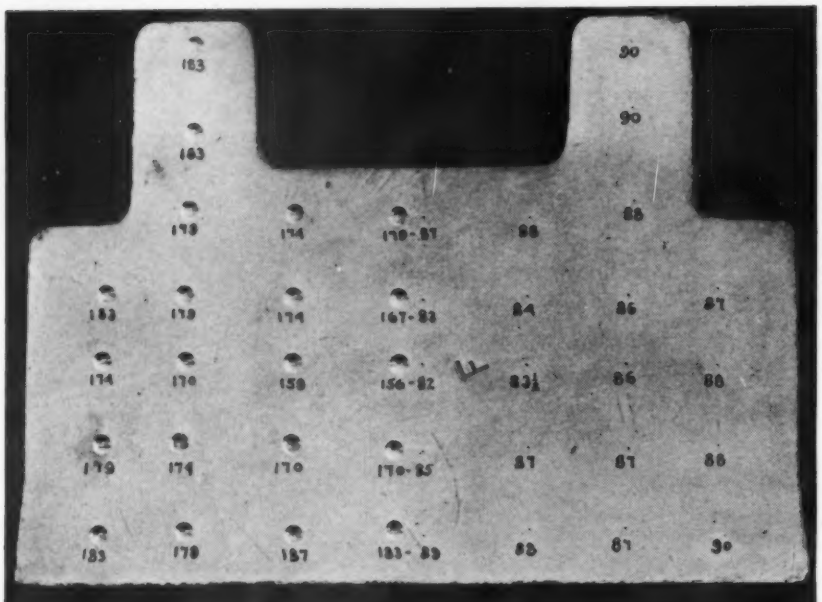
Cross-sectional views of extrusions for aircraft inner-wing spar caps made from 14S (top), 24S (center) and 75S (lower) aluminum alloys. Etched section shows piping in the 14S. A typical crack is visible in the extrusion made of 24S. The cross-sectional area of the 75S extrusion is sound

center core. The difference in the shape of the cross-sectional areas of these two extrusions accounts for their different reactions to the internal stresses involved.

Then 14S aluminum alloy was tried and this proved entirely satisfactory. The mechanical properties specified by the stress group were easily met and the extrusions showed a uniformity of properties throughout their entire length—there being practically no difference in the mechanical properties of standard test bars cut from the front, middle, or back sections, when taken from the same position relative to the center of the cross-sectional area.

Both of these large extrusions, however, do show a variation of mechanical properties between the center and edges. This is true in the transverse as well as the longitudinal directions, the center section values being from 5 to 10 percent lower than those obtained near the edge. This variation is well shown by a Rockwell or Brinell hardness survey across the ends of the extrusion. The longitudinal properties correlate closely with the hardness numbers.

With the ever increasing tempo of the war, and as more and more demands were made for increased range and additional equipment to be carried by the airplane, the loads carried by these parts also increased, until the minimum stress requirements had to be raised. The horizontal transverse properties of the front upper inner wing spar cap became critical and it became necessary to check the strength of each individual spar cap. To do this a horizontal transverse test bar is cut from the end of each extrusion through the center or weakest part. If this test bar meets the minimum requirements as specified by the stress group, the extrusion is accepted; but if it falls below the minimum, two additional test bars are taken, one above and one below the original, both of which must be above a specified value for the extrusion to be



Variations of mechanical properties between the center and edges of an extrusion made of 75S is demonstrated by Brinell and Rockwell readings across the cross-sectional area

acceptable. In spite of the fact that the minimum horizontal transverse requirements have been raised 14 percent over their original values, and there has been no change in the size or design of this spar cap, there have been less than 1.8 percent rejections for low mechanical properties on this part, as made from 14S alloy.

Looking forward to still greater demands on these inner wing spar caps, experimental extrusions were made from the high-strength 75S aluminum alloy. These proved entirely sound. Although there is a somewhat greater variation in the mechanical properties between the center and edge of these extrusions than there is with the 14S alloy, the greatest strength is at the outside fibers where it is most desirable and there is an over-all increase of strength of from 8 to 10 percent over those made of 14S. For this reason 75S material will probably be specified on future orders for these parts.

Laboratory Tests Made

Close metallurgical control is maintained over both of these large extrusions. A section is cut from each end of every extrusion and sent to the laboratory, where it is etched with 20 percent caustic soda, cleaned up with nitric acid, and examined under a hand lens. Any irregularity is cause for rejection. The most common of these are: the "extrusion defect," or piping, where there is a segregation of oxides and other constituents concentrated at the center of the rear end of the extrusion and "excessive skin condition," where the oxide of the extrusion skin penetrates to such a depth that it will not clean up on machining.

Occasionally there are small particles of oxide or dross scattered irregularly throughout the extrusion due to faulty pouring of the original ingot. The front and back ends of the extrusions are easily recognizable after the caustic etch as there is always more recrystallization at the edges of the back end than at the front. Occasionally there is a small core at the center of the front end that still shows the "as cast" dendritic structure of the original ingot, when there has not been sufficient crop cut from the front end of the extruded section. The total rejections for all metallurgical reasons has been less than 1.2 percent.

There has been a large saving in both material and labor in making these inner wing spar caps from 14S extrusions instead of from forgings. The cost of machining the extrusions is only one-third of that of the forging and the material costs 42 percent less than for the die forgings and 75 percent less than for the hand forgings. The reason for this cost saving can easily be seen by comparing the weights of the initial material used. The hand forging blank weighs 625 lb., the die forging 250 lb., and the extrusion for the upper and lower spar caps, 369 and 308 lb., respectively. The corresponding weights for the finished spar caps are 130.5 and 105.5 lb., respectively. It is to be noted, at the time the change was made from forgings to extrusions, there were no die forgings available—due to the breaking of an irreplaceable die.

Bowing Difficulties Overcome

At first there was some difficulty experienced with warpage and bowing of the 14S extrusions during machining. Minor adjustments of the cutters on the Onsrud spar miller eliminated most of the twisting, and careful straightening took care of the bowing. The 75S extrusions bowed more than the 14S and required slightly more power to machine on the spar mill—when milled with the same set-up used for the regular production run on the 14S spar caps. This is due to the increased hardness and strength of the outer fibers of the 75S extrusions. In production on 75S, an extra blanking cut at the start of the milling operation will eliminate most of this excessive bowing at little additional cost and cut down a large amount of final straightening, now necessary, on the finished spar caps.

The use of these large section extrusions, to replace the forgings formerly used in making these inner wing spar caps, has not only increased the allowable load which they can carry, without any additional increase in their size or weight, but has also saved Northrop several hundred thousand dollars in the cost of labor and material in producing them for the current army contracts.

Fingernails Affect Machine Designs

BELIEVE IT or not, fingernails, plain or painted, are affecting machine design. One machine tool shop I was in recently told me they were abandoning pushbutton controls to suit women operators of their machines. Girls catch their fingernails on the parts surrounding the pushbutton, and break their nails. And with nails so colorful as at present, a broken nail shows up all too plainly. So, in place of button controlled switches they are using small handles which can be flipped to one side and with no contacts that can catch the nails of the operation.

SUSTAINED CONSTRUCTION ACTIVITY

One Step Toward High Level Employment

IN the 34th editorial of this series, it was pointed out that sustained prosperity, based on high level employment, was a major postwar goal accepted by government, management and labor.

That editorial developed the theme that, if the goal were to be approached without undue sacrifice of our essential liberties, we must forego the search for magic panaceas, and follow the harder but more promising course of analyzing step by step, and industry by industry, the measures that might contribute toward the end sought.

This is the first of a number of editorials following such a particularized approach. It will examine the role of the construction industry in forwarding sustained prosperity.

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The influence of construction upon the general level of economic activity is important but not decisive. The claim is frequently advanced that major fluctuations of the business cycle might be ironed out by a properly devised and timed public works program; but any examination of the relatively modest contribution of construction activities to total national output will demonstrate its extravagance.

In the twenty years from 1920 through 1939, the value of new construction averaged just over 8½% of the gross national product. If we add repair and maintenance expenditures, the total is increased to a little over 12% of the gross product. But approximately two thirds of the construction of this period was privately initiated, and only one third was represented by government construction, federal, state and local combined. To expect that we can level out the peaks and valleys of our whole economy through manipulating the 4% portion that is represented by government construction is to expect a very small tail to wag a very large dog.

In fact, the record of construction activity in the past has been on the side of disequilibrium rather than stabilization. In boom times construction activity has climbed to relatively higher peaks than those reached by the economy as a whole; in depression periods it has fallen to deeper troughs. Aside from the special work relief program of the depression thirties, the performance of public construction in this respect is little better than that of private. New government construction mounted with the general trend of the boom from 1921 to 1929, thereby adding its weight to the inflationary trend.

Instead, then, of expecting the construction industry to stabilize our whole economy—a task clearly beyond its power—it would seem appropriate to ask that it look to the more attainable goal of leveling out its own violent fluctuations. If this can be done, many of the most vexing problems of the construction field and of its sphere of influence will be mitigated, employment will be regularized in one important segment of industry where the past record has been particularly uneven, and one aggravating contribution to general business instability will be removed.

The achievement of these highly important, if limited, aims will require the thoughtful, vigorous, and concerted cooperation of management and labor in the construction industry, of a variety of governmental agencies, and of those who direct the sources of construction credit. Of the many measures that must be woven into an ordered program, it is practicable here to present only the broad outline of those which seem to offer the greatest potential usefulness.

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1. Stabilization implies the holding of a balance rather than a freezing at a given level. No rigid formula for a most desirable level of construction activity is possible or desirable. However, it may be accepted as a reasonable initial premise, that we could sustain in the future without major distortion something like the 12% ratio of total construction to gross national product that has been approximated in the past. If it is to serve as an useful reference point, such a generalized premise must be subjected to constant testing both nationally and locally. There must be careful and continuous scrutiny for signs of demand saturation, cost inflation, and labor shortages, all danger signals of far greater reliability than any percentage formula.

The first requisite then is the general availability of information along such lines, far more complete and current than has hitherto been at hand. The second is a general will to hold building activity at a level as high as but not higher than we probably can sustain. Once this principle is accepted, the problem becomes one of marshalling all available instrumentalities to forward it.

2. Public construction, although too small to exert a decisive influence upon economic activity as a whole, can

condition construction trends to a major degree. If, in the decade following the war, government construction approximates its 1920 to 1940 average of one third of all construction, its properly timed impact could do much to level out the construction cycle.

To do this most effectively, public construction should be deferred where and when private building is going forward at a satisfactory pace, and should be started when and where private activity shows undue slack. All government construction does not lend itself to such adjustment. But a large portion of it could be held up for the three to five years which, upon past experience, would provide the necessary leeway to counteract the more violent fluctuations in private building.

Such a program presents numerous difficulties both political and administrative. None should be insurmountable, and the results promise to be of sufficient moment to justify the extraordinary effort that would be required to coordinate federal, state and local government programs. Here is an excellent forum for testing whether or not government economic activity can be made to supplement rather than supplant private effort to serve ends upon which all are agreed.

3. Since private building, postwar as in the past, must supply the preponderant share of construction activity and employment, costs will continue to play a dominant role in determining levels of operation. Wartime restrictions have created formidable backlogs of deferred demand for most types of private, and for many of public, construction. Such demand is so great that it almost certainly will provide the impetus for a postwar building boom of several years duration. There is considerable doubt that in the beginning our building trades, dislocated by war and at low ebb, can organize rapidly enough to carry their share of the anticipated general advance.

However, if former patterns hold, building activity, after a lagging start, will soar, costs will mount, and eventually will saturate effective demand with resultant collapse. That, of course, is precisely the sort of a situation we are seeking to avoid. Crucial to this end is the prevention of rising costs or, better still, the reduction of building costs from present swollen levels.

A recent study by technicians of the War Production Board on the outlook for private housing construction illustrates the point. From 1900 to 1940 the number of housing units built in this country closely matched the statistics of new family formation. The former ran considerably ahead of the latter from 1920 to 1929, and fell behind by the same margin in the following decade.

If the market for new houses were to be similarly limited for the period from 1940 through 1949, the effective demand for new housing during the last five years (1945-1949) is estimated at 3,000,000 units. That is after allowing for houses built from 1940 through 1944, and for vacancies, demolitions, and other factors. If, however, prices could be reduced to 1939 levels, the 3,000,000 unit demand is estimated as increasing to more than 7,000,000 units. Since the latter figure is substantially beyond our production capacity for the period, a backlog would be created that would support an effective sustained demand for the subsequent decade (1950-1959) of 1,000,000 units per year, as against half that amount if rents and sales prices mount with increasing incomes.

The precise accuracy of such an estimate may well be questioned. There can be no question as to the general validity of the point illustrated. The progressive lowering of construction costs will stimulate demand in this field as it has in others. Building management, labor, and their suppliers and customers stand to gain from such a result. Unnecessary restrictions against the adoption of improved technologies and increased productivity should, therefore, be removed, whether imposed by codes of government, regulations of unions, collusion of managements, or inertia of workers. Unless there are compelling social justifications such restrictions must be judged harmful to the whole economy.

4. Numerous other measures could contribute substantially to increased and increasingly stable construction activities. Space remains only to stress the importance of careful consideration for the use of credit facilities as a means of stabilization. In recent years the establishment of the Federal Housing Administration provided a needed stimulus to mortgage lending in the field of housing. The modern pattern of long-term mortgages, providing for regular amortization as well as interest, should be a steadying factor in periods of liquidation. However, there appear to be further possibilities for using credit facilities as a brake when construction activity threatens to climb beyond a level that can be sustained. If public and private lending agencies could devise sound means for raising mortgage rates, increasing down-payment requirements, shortening amortization periods and basing value appraisals upon normal rather than inflated costs, they might exert a healthy influence against the tendency of the construction bubble to inflate until it bursts.

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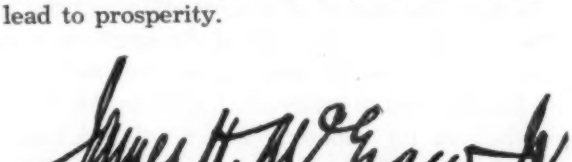
There is no royal road to sustained high level employment. There is not even a single path to assured construction stability—there are many paths, all strait and narrow and all paved with bruising cobbles. This is true for all other major segments of industry.

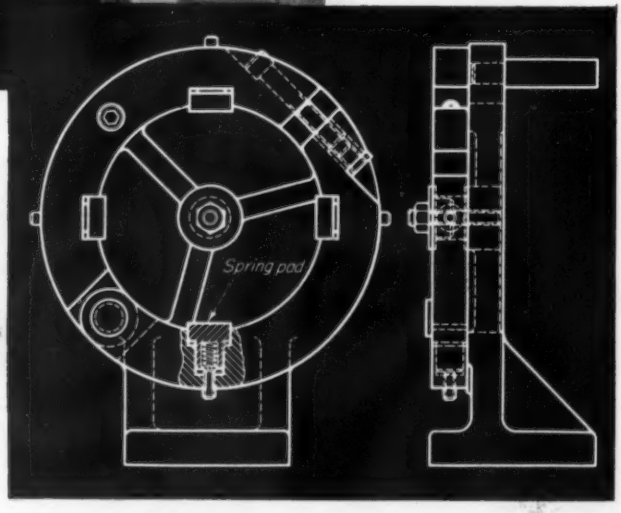
It is easier to seize upon a magic formula such as monetary control, or deficit spending, or any one of a score of others, than to undertake an intricate task of piecemeal exploration. But only the latter course will lead to prosperity.



President, McGraw-Hill Publishing Co., Inc.

Two men play oxy-acetylene flames on the broken cutter body, so that the silver solder is melted before the heat reaches the teeth

Cutters from four to eight inches in diameter can be held in this fixture, provided that the proper set of spring pads is employed



Brazing Fixture

SPEEDS REPAIR OF

Broken Milling Cutters

FOR REPAIRING broken milling cutters at Chevrolet-Flint, a special brazing fixture has been developed with spring-loaded locating pads that hold the broken pieces firmly together. Each of the four pads is spring loaded in order to exert continuous pressure against that portion of the cutter with which it comes in contact. This arrangement insures proper alignment of the broken pieces and, at the same time, allows the pads to move back and forth as the cutter expands and contracts from heating and cooling.

The fixture itself consists of a cast-iron base and frame with a split steel ring bolted to the frame. The four spring-loaded pads are equally spaced inside the ring, which is 11 in. O.D., 8 in. I.D., and 1½ in. wide.

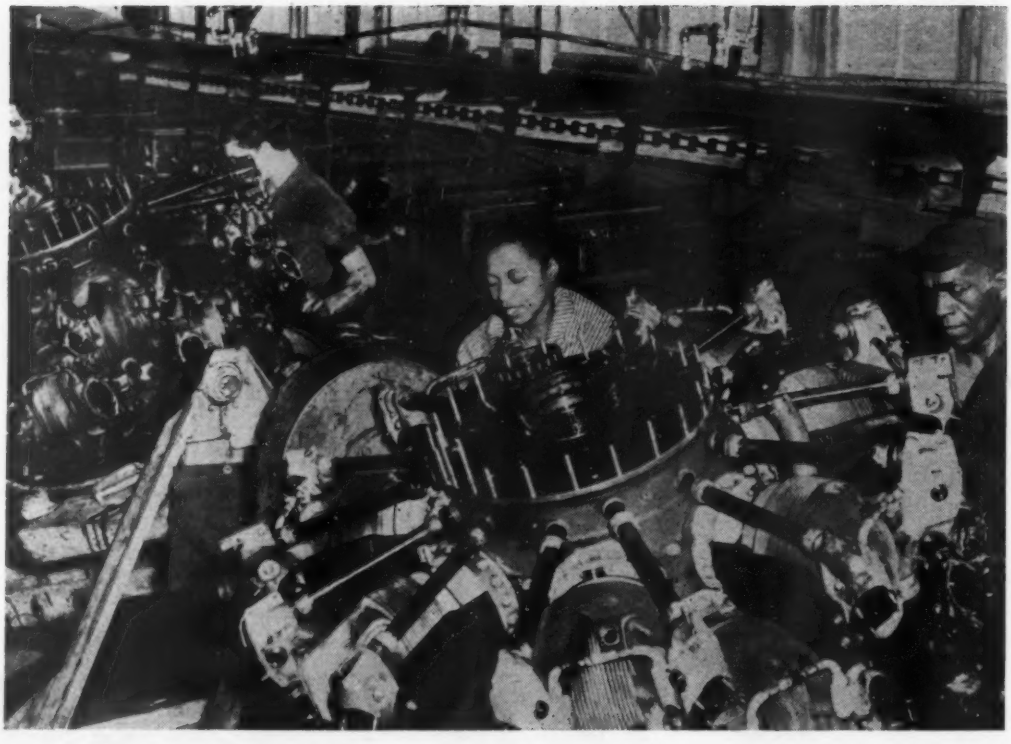
In preparation for brazing the cutter, both surfaces of the break are thoroughly cleaned—with a solvent if necessary—and coated with flux. A strip of silver solder is cut, a little wider than the pieces to be brazed. And then the cutter is assembled in the fixture with the solder in position between the two broken pieces. Finally, when the pieces are properly located in the fixture, two men, each with an oxyacetylene torch, heat the cutter simultaneously to make the bond.

All sorts of expedients have been used to hold together the pieces of broken cutters during brazing, but here is an equalizing fixture which mates the pieces properly

Acetylene and oxygen are used rather than city gas and air, because a high-temperature flame is necessary to supply sufficient localized heat for melting the solder quickly. This avoids spreading of the heat to the cutter teeth with consequent drawing and softening of the tool steel.

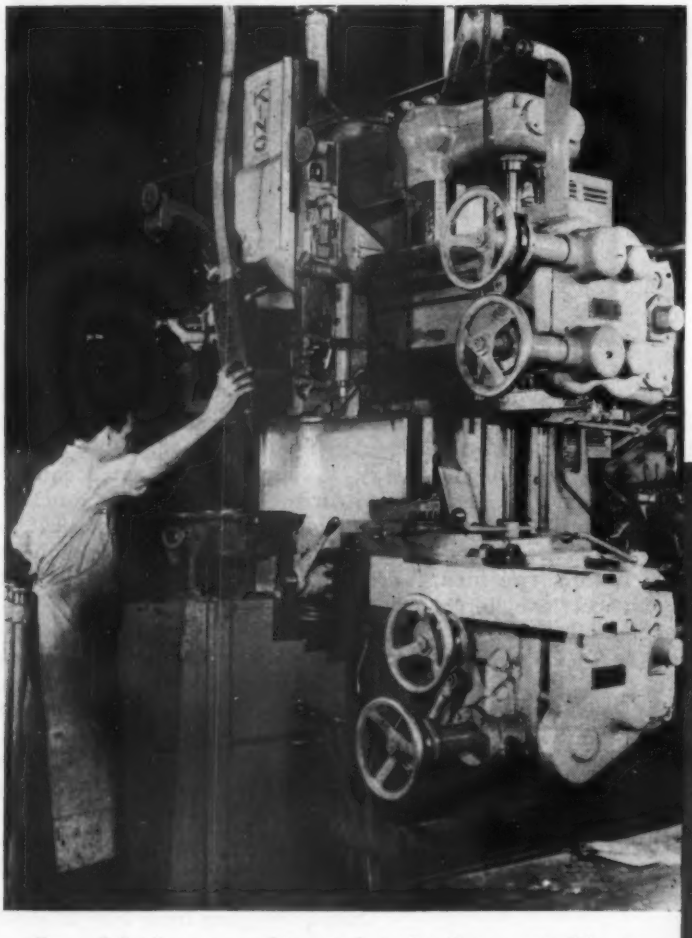
On the repair job shown approximately 20 min. was required to clean and prepare the cutter for brazing, and 30 min. to complete the actual brazing operation. In this particular instance the cutter was allowed to cool for three hours before being removed from the fixture, but ordinarily work can be removed within ten or fifteen minutes with no ill effects.

Cutters ranging from four to eight inches in diameter can be repaired on this fixture, which cost very little to assemble.



First the engine is disassembled. This is an early phase of the disassembly line which is 38 engines long or about 276 ft. It is moved by a chain in the floor which pulls the dolly stands on which the engines are mounted. The speeds may be varied from 6 to 48 ft. an hour. Each operator in the line carries out only one or two specific tasks. Small components are put in moving trays at the rear

How the Army Overhauls AIRCRAFT ENGINES

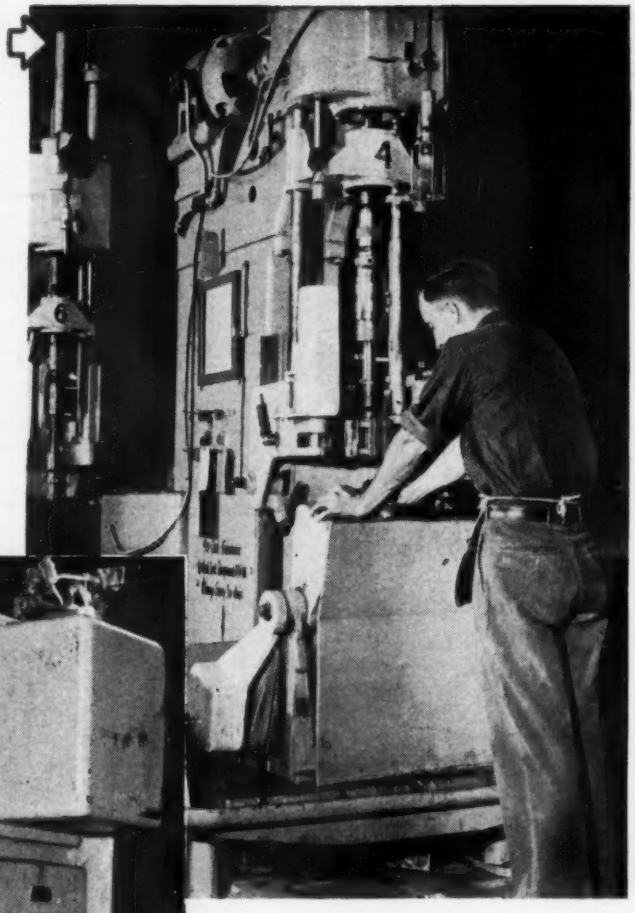


One of the larger machine tools is the King vertical boring mill. It is shown here reboring a damaged diffuser case prior to the installation of a new insert

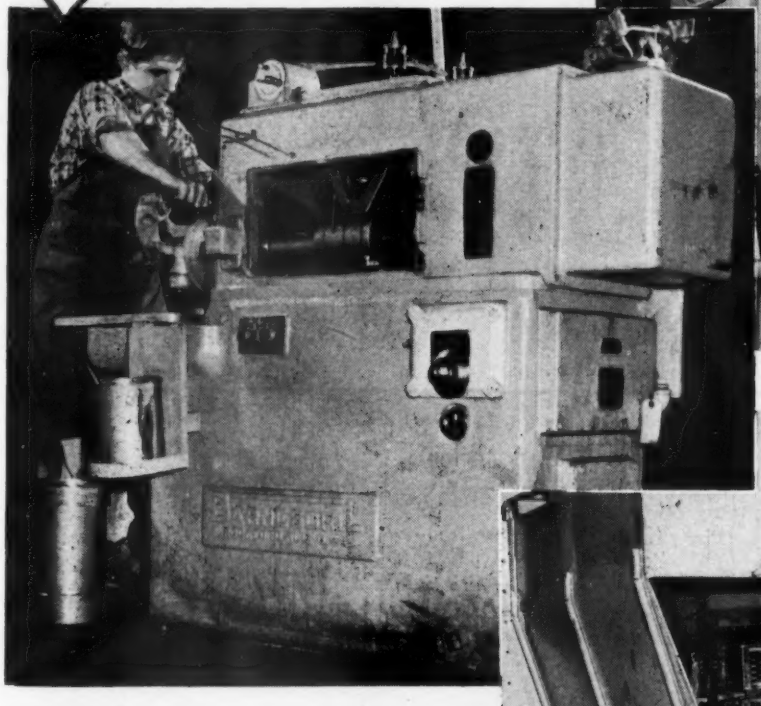
AIRCRAFT engine overhaul on a mass production basis is one of the Air Technical Service Command's primary means of keeping the Army Air Forces in top flying trim. The Engine Overhaul Section of the Fairfield Air Technical Service Command at Patterson Field, Ohio, one of twelve domestic maintenance and supply control centers in the A.T.S.C., overhauls 1,200 to 1,500 engines a month on an assembly line system patterned after industrial production lines.

Three types of battle-weary engines are handled at this one big plant—Pratt &

Cylinders are honed in a battery of 21 Barnesdril machines. Those for Pratt & Whitney engines are honed to 0.006 in. oversize, or are chrome-plated to a standard or rebarreled. Wright nitrided cylinders have but one standard size with a tolerance of 0.008 in. If over this, they are ground for chrome-plating to standard size. The coolant is kerosene, 48 parts to one of International Compound No. 155

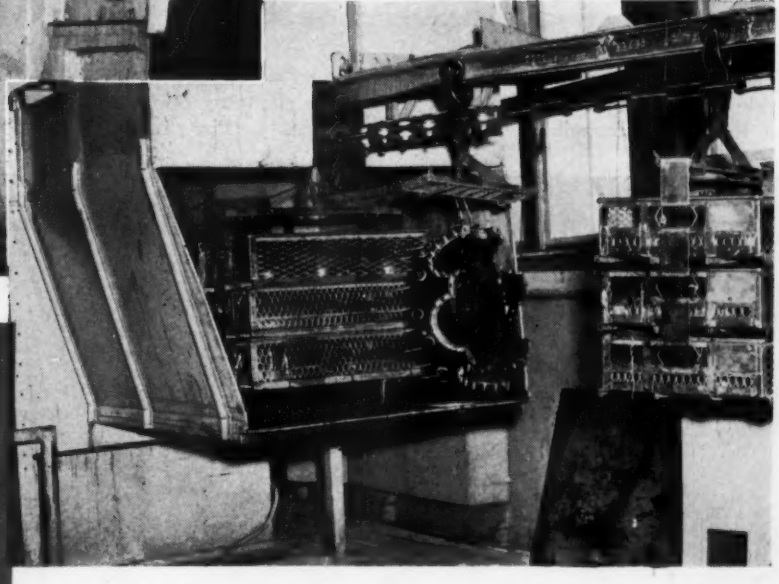


Barnesdril horizontal machines are used to lap piston rings. Twenty-five strokes are taken using time-saver lapping compound. After this operation the rings are installed in the piston, wrapped and marked, and sent with the cylinders to the final assembly line. Thus the piston rings and cylinders are kept together for reassembly



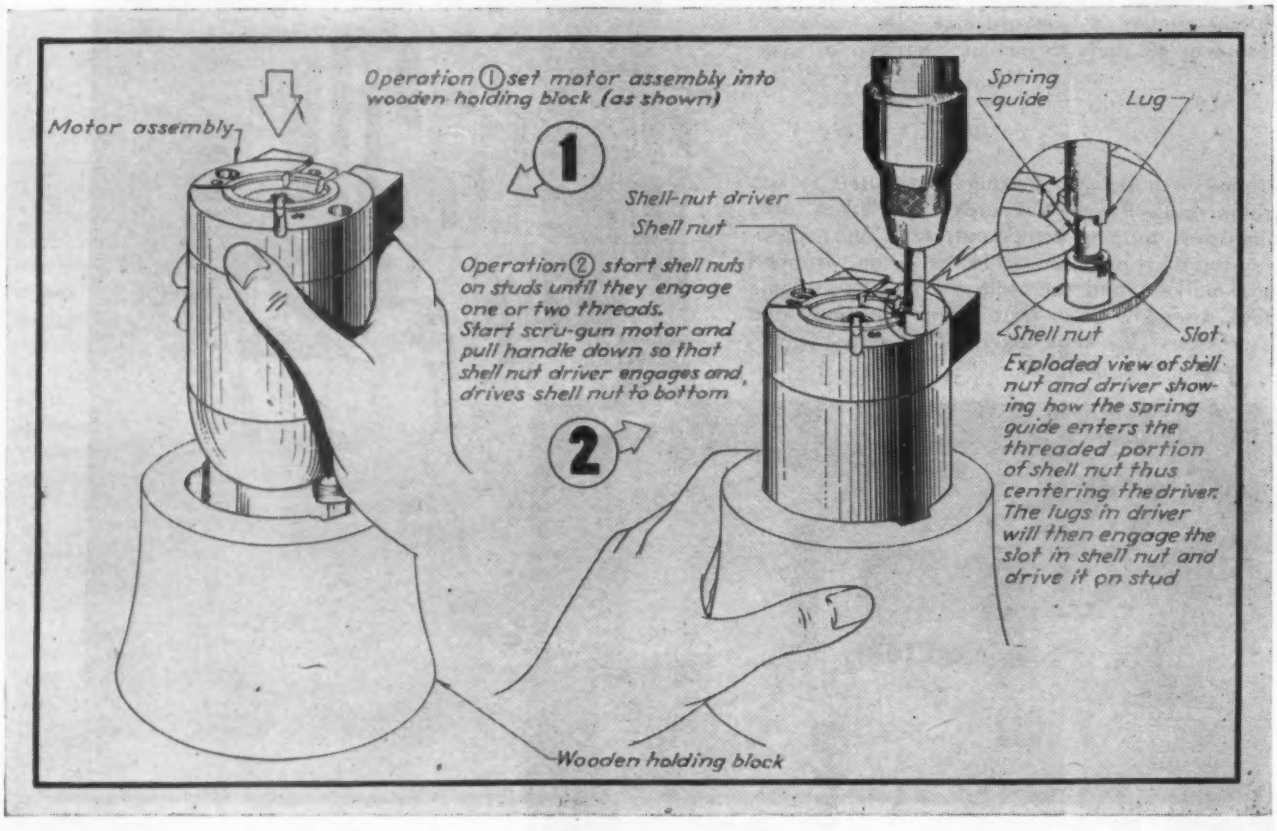
Whitney 1830s and R-2000s (twin Wasps), and Wright 1820 Cyclones. Only one type of engine is run through the elaborate overhaul system at a time, usually in lots of 500 to 1,000.

An overhaul includes a complete dismantling of the engine, thorough cleaning, polishing, inspection, repair or replacement of defective parts and reassembly. The entire operation is carried out on a series of conveyors attended by some 1,500 civilian workers.



Engine parts are carried through an elaborate cleaning process on a monorail conveyor. They are taken through three washing units. The first is a degreaser consisting of 900 gal. of water to 40 lb. of formula C heated to 180 F. and sprayed at 110 lb. per sq. in. The parts then travel through four 90-ft. tanks, all containing Magnus 755. In the second washer the parts are taken through a spray solution of 50 percent kerosene and 50 percent formula C, heated to 140 F. at 110 lb. per sq. in. The third washer comprises three stages: The first a wash of 310 gal. of water to 10 lb. of formula C at 180 F., and 110 lb. per sq. in. The second and third stages consist of kerosene heated to not over 100 F. at 100 lb. per sq. in.

PRODUCTION DRAWINGS Prove


Motor assembly
Operation ① set motor assembly into wooden holding block (as shown)
1
Shell-nut driver
Shell nut
Operation ② start shell nuts on studs until they engage one or two threads. Start scru-gun motor and pull handle down so that shell nut driver engages and drives shell nut to bottom
2
Wooden holding block
Spring guide
Lug
Shell nut
Slot
Exploded view of shell nut and driver showing how the spring guide enters the threaded portion of shell nut thus centering the driver. The lugs in driver will then engage the slot in shell nut and drive it on stud

Guided by a production illustration, shown in detail above, the girl operator below is engaged in driving shellnuts on studs in the motor assembly. Note hand positions in the drawing

PRODUCTION ILLUSTRATIONS have generally been associated with the manufacture of large subassemblies, but Adel Precision Products Corporation has demonstrated their value in the assembly of precision devices composed of relatively small parts. In fact the company uses three-dimensional drawings at work stations in nearly every phase of its manufacturing operations.

The production illustration department personnel have been trained in pictorial presentation of detailed assembly steps. They work in close cooperation with shop supervisors and foremen in making plans for the various production illustrations. For example, a shop foreman is in the best position to explain the work of his particular section, such as the fabrication methods used, the handling of fixtures, jigs and other tools, and the sequence of manufacturing operations.

When completed, illustrations are

Helpful in Assembling Precision Parts

Illustrations bear specific data for assembly of small components at each work station. They are particularly useful for novices and assist experienced operators

BY WILLIAM LAWRENCE LEWIS, INDUSTRIAL ENGINEER,
ADEL PRECISION PRODUCTS CORPORATION

prominently displayed at the various work stations. Their chief advantage lies in the instructional value that new workers derive, and they serve to spare shop foremen and leadmen from the hundred and one questions that would be asked except for the clarity of the pictorial views. Experienced operators often refer to them for reminders.

To fulfill its complete function, the production illustration must conform absolutely with authorized shop procedure. Actual parts are used in preparing the drawings, and every effort is made to present the components so that the operator can refer to them from his working position without having to figure out whether it is a left- or right-hand approach.

In this connection, many of the drawings include hands to show proper positioning in assembling parts. Generally, parts are shown in lifesize since this is the easiest for the workers, particularly those less experienced in the operations.

Where small parts predominate, however, it is often necessary to magnify a part or a portion of it. For this purpose, an enlarged view of a smaller designated portion of a drawing is used. Illustrations to indicate the relative assembled position and relationship of the individual parts of an assembly follow the "exploded view" technique.

Production illustrations for small precision products often require more concentrated detail because of close tolerances and superfinishes. Omission of some small element from an assembly results in rework or scrapping of parts or whole assemblies. Thus the production illustration must show each element through the fabrication of a precision part.

The drawings used at Adel bear detailed but concise lettering to amplify the visual. In addition to the detailed assembly legend, the drawings carry notes on handling instructions so that fragile and delicate parts will not become scrap items because of a careless nick or scratch.

Fabrication-job illustrations resolve themselves into route sheets and emphasize such operations as milling, lathe work, grinding and other operations required for producing the part. Heat-treating and electroplating are likewise illustrated.

The production drawings are not confined to production and assembly operations, but carry right on through line inspection, station-to-station inspection, and testing. Here again detailed instruction notes are included on the drawings.

An example of an assembly operation of this precision type for which production illustrations are used is the assembly of a fluid metering pump. This is an electrically driven pump of small capacity, 5 to 30 gal. per hr., used extensively in the anti-icing systems

General view of assembly line for fluid metering pump at Adel Precision Products. The motor portion of the unit is assembled on the bench line to the right; the pump portion is assembled at work stations on the left. Work flows from rear to front

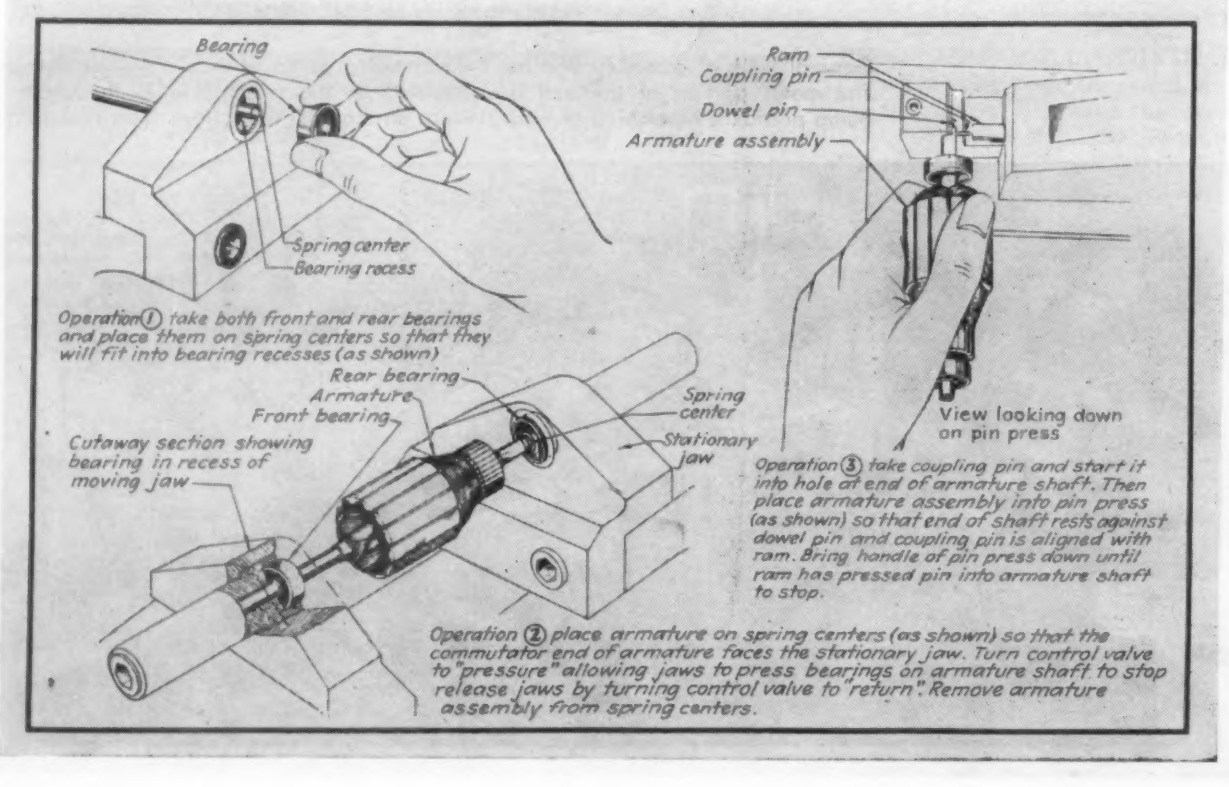
At this station, front and rear bearings are pressed on the armature shaft and press pin. The three operations necessary for the assembly are graphically shown below

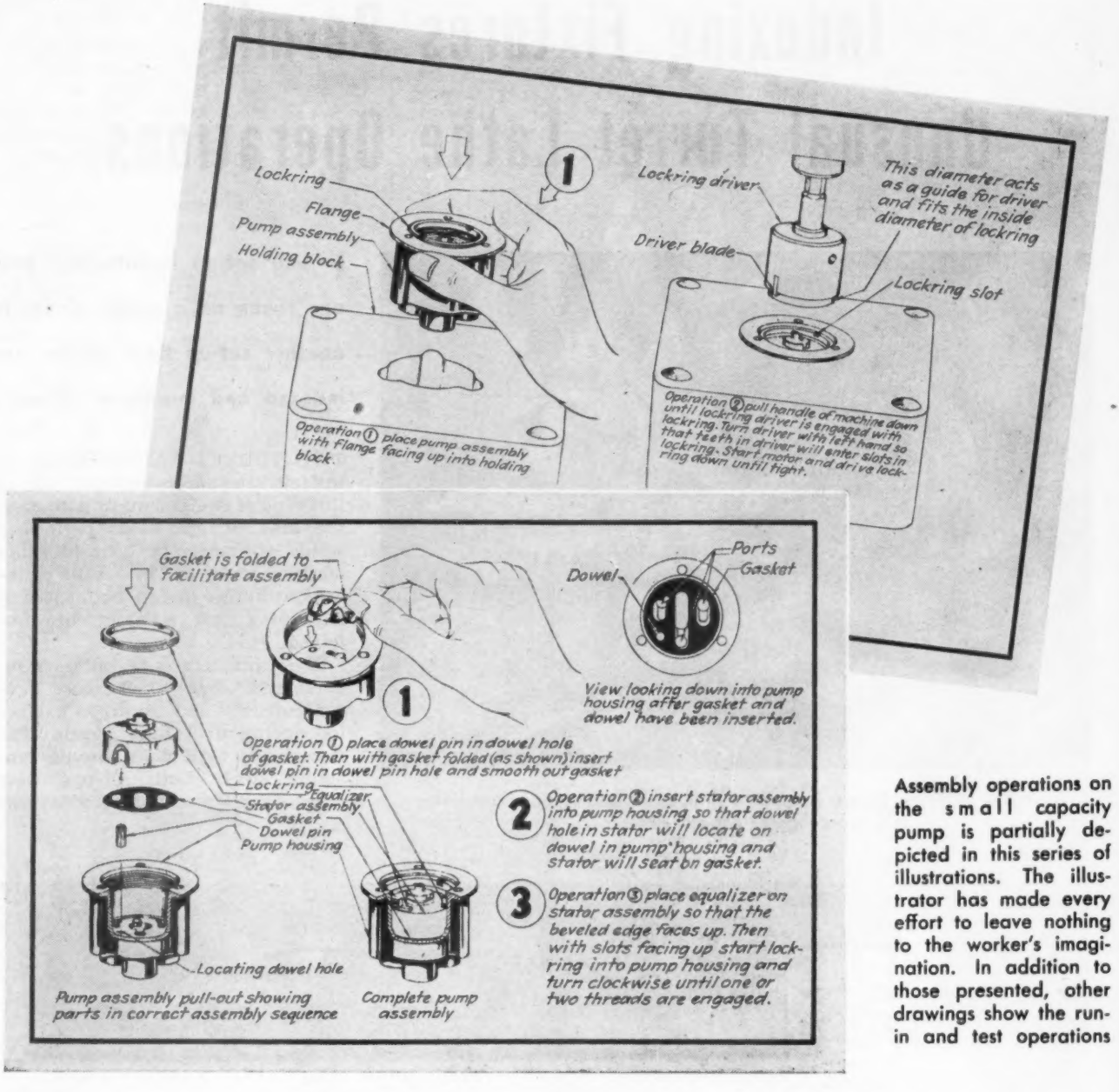
of airplanes. The preciseness of the operation of assembling the pump is indicated by the fact that clearances of 0.00015 in. must be maintained in some instances.

The pump consists of two principal subassemblies—the motor and the pump proper. Each of the two components is assembled independently within its own portion of the housing shell as it moves along one of two parallel legs of the assembly line. At the junction of the two legs, the pump and motor are joined to form a completed unit. This moves along the remainder of the line for run-in and final tests.

Seven work centers make up the motor branch of the line, corresponding to the seven major steps in the assembly of the motor. Each work center consists of one or more individual work stations. A longitudinal partition wall runs the entire length of the motor line, the work centers being located on one side of that wall. Work stations on the opposite side of the wall are used for preparing minor motor subassemblies.

At each work station on the motor line, attached to the wall and facing the operator, is a production illustration depicting the entire sequence of operations performed there. The drawing includes notes giving the names of the parts handled at that


Bearing
Spring center
Bearing recess
Operation (1) take both front and rear bearings and place them on spring centers so that they will fit into bearing recesses (as shown)
Rear bearing
Armature
Front bearing
Cutaway section showing bearing in recess of moving jaw
Spring center
Stationary jaw
Ram
Coupling pin
Dowel pin
Armature assembly
View looking down on pin press
Operation (3) take coupling pin and start it into hole at end of armature shaft. Then place armature assembly into pin press (as shown) so that end of shaft rests against dowel pin and coupling pin is aligned with ram. Bring handle of pin press down until ram has pressed pin into armature shaft to stop.
Operation (2) place armature on spring centers (as shown) so that the commutator end of armature faces the stationary jaw. Turn control valve to "pressure" allowing jaws to press bearings on armature shaft to stop release jaws by turning control valve to "return". Remove armature assembly from spring centers.


Lockring
Flange
Pump assembly
Holding block
1
Operation ① place pump assembly with flange facing up into holding block.
Lockring driver
Driver blade
This diameter acts as a guide for driver and fits the inside diameter of lockring
Lockring slot
Operation ② pull handle of machine down until lockring driver is engaged with lockring. Turn driver with left hand so that teeth in driver will enter slots in lockring. Start motor and drive lockring down until tight.
Gasket is folded to facilitate assembly
1
Operation ① place dowel pin in dowel hole of gasket. Then with gasket folded (as shown) insert dowel pin in dowel pin hole and smooth out gasket
Dowel
Ports
Gasket
View looking down into pump housing after gasket and dowel have been inserted.
Lockring
Equalizer
Stator assembly
Gasket
Dowel pin
Pump housing
2
Operation ② insert stator assembly into pump housing so that dowel hole in stator will locate on dowel in pump housing and stator will seat on gasket.
3
Operation ③ place equalizer on stator assembly so that the beveled edge faces up. Then with slots facing up start lockring into pump housing and turn clockwise until one or two threads are engaged.
Locating dowel hole
Pump assembly pull-out showing parts in correct assembly sequence
Complete pump assembly

Assembly operations on the small capacity pump is partially depicted in this series of illustrations. The illustrator has made every effort to leave nothing to the worker's imagination. In addition to those presented, other drawings show the run-in and test operations

station, and the exact method of positioning and using the parts and the tools required for their assembly. A total of nine production illustration sheets, approximately 10 by 16 in. in size, are required for the seven work centers of the motor line.

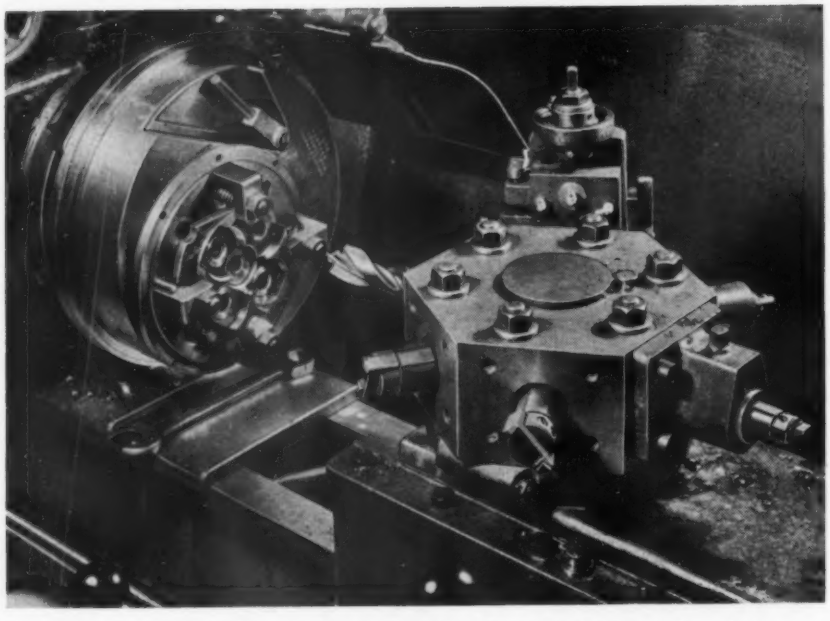
Assembly of the pump portion of the unit is done on a similar and parallel leg of the assembly line, and each step in that process is depicted in a similar manner for each work center or station. It happens that certain portions of the pump assembly can best be illustrated by using an exploded-view drawing at several work stations. Each operator concerns himself with that portion pertaining to his assembly duties.

Because of small clearances, the selective method of assembly of parts is used. Parts are supermiked before assembly and segregated into groups that are within very small limits of dimensional variation, such as 0.0001 in., and assembly of a part from one of these groups must be made with one of a correspondingly segregated group of mating parts. This permits maintenance of small clearances without imposition of tedious and impractical manufacturing limits.

After the unit has been assembled, all subsequent run-in and tests are covered in detail by production illustrations. For example, the instruction sheet for the operator of the run-in rack explains the scheme of clock-driven flags that are used to indicate the passage and completion of the one-hour test run to which each unit is subjected. Similarly, a sheet at the test station indicates the way in which the pump is to be connected to the power and fluid lead lines, and the significance and numerical value of the reading of the various gages that are used to indicate the pump's performance.

Production illustrations are playing an important role in a wide range of manufacturing processes. They have received particular emphasis during the war and have been most useful in training new employees in a minimum of time. It is predicted that they will receive a broader field of use in the production of postwar products.

Indexing Fixtures Permit Unusual Turret Lathe Operations

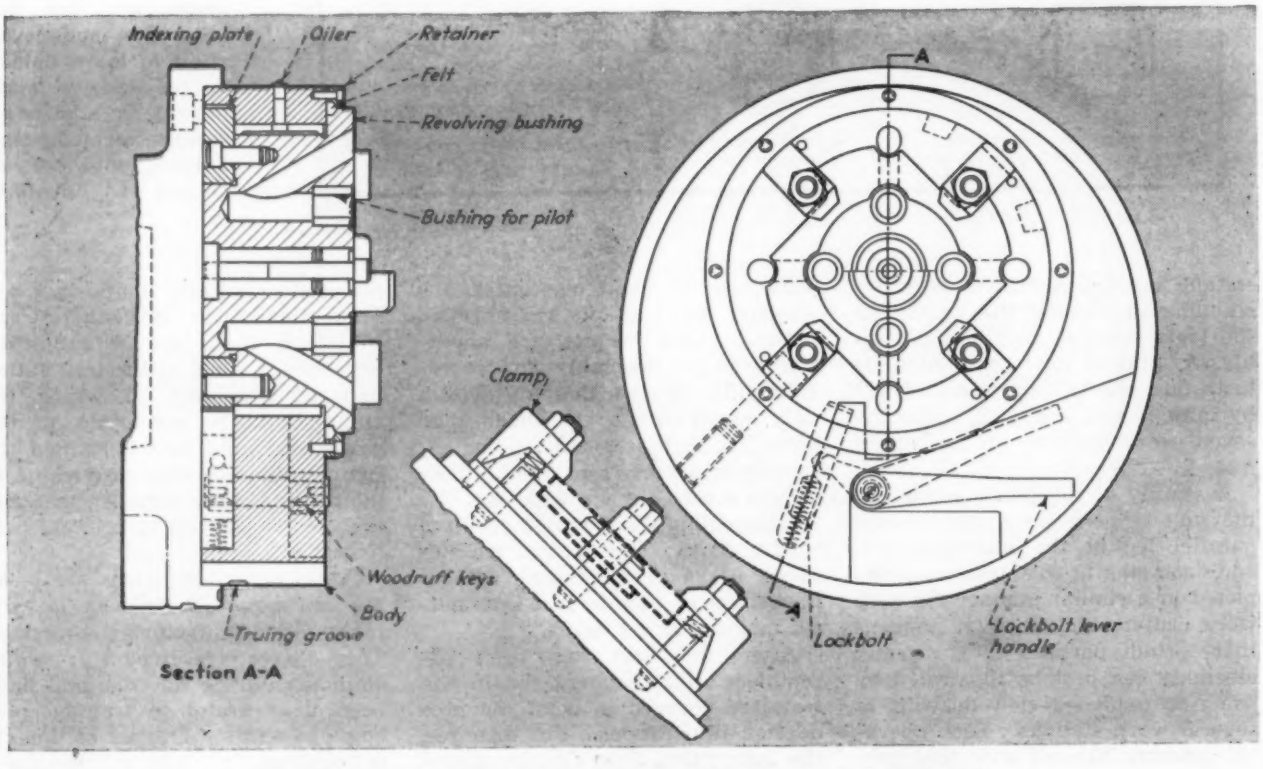


An offset indexing fixture is used to drill, bore and trepan four holes in a supercharger cage in one set-up

In one set-up twenty-four cuts are taken on a single piece; in another set-up three pieces are indexed and machined at once

TWO TURRET LATHE set-ups illustrate an unconventional use of this type of equipment. In both cases the kind of operations performed would ordinarily be done on other machine tools; but by means of ingenious fixture design, both speed of machining and accuracy are obtained.

The workpiece is an aircraft supercharger cage which must have concentricity and accurate balance for operation at high speeds. The material is SAE 6270 chrome-vanadium steel. Both set-ups were made on a Warner and Swasey No.



Details of the fixture show how the revolving portion is locked and released to machine the workpiece in four different positions

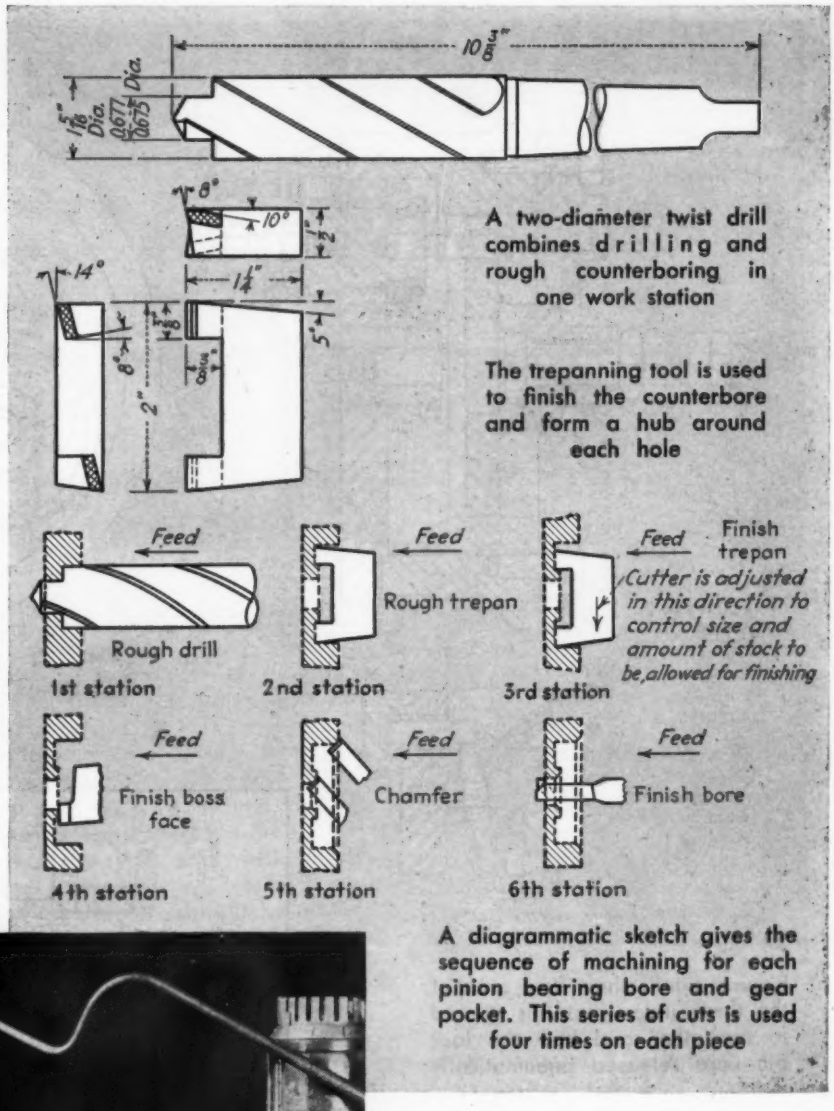
4 universal turret lathe and reflect the versatility of this machine.

In the first set-up, six operations are performed, one for each indexing of the hexagonal turret. This series of cuts is taken four times on each workpiece at locations that are not concentric with its outside diameter.

The fixture is mounted on a standard flange nose faceplate and carries an eccentric plate to which the workpiece is clamped. Indexing this plate within the body of the fixture enables the turret lathe operator to throw successively each portion of the workpiece to be machined on the center line of the spindle.

The body of the fixture is recessed to hold a lever which withdraws a lock bolt against spring pressure. The bolt engages one of four tapered slots in the revolving portion of the fixture to locate it at the index points. At the end of such series of operations the bolt is disengaged and the workpiece revolved to bring the next quadrant in line with the spindle.

The sequence of operations is rough drill, rough trepan, finish trepan, finish boss face, chamfer and finish bore. These steps machine the pinion bearing bores and gear pockets. Center distances are held within 0.002 in. and the boss for each hole is finished within 0.005 in. The surface required must have a Profilometer reading of 100 or better.



A two-diameter twist drill combines drilling and rough counterboring in one work station

The trepanning tool is used to finish the counterbore and form a hub around each hole

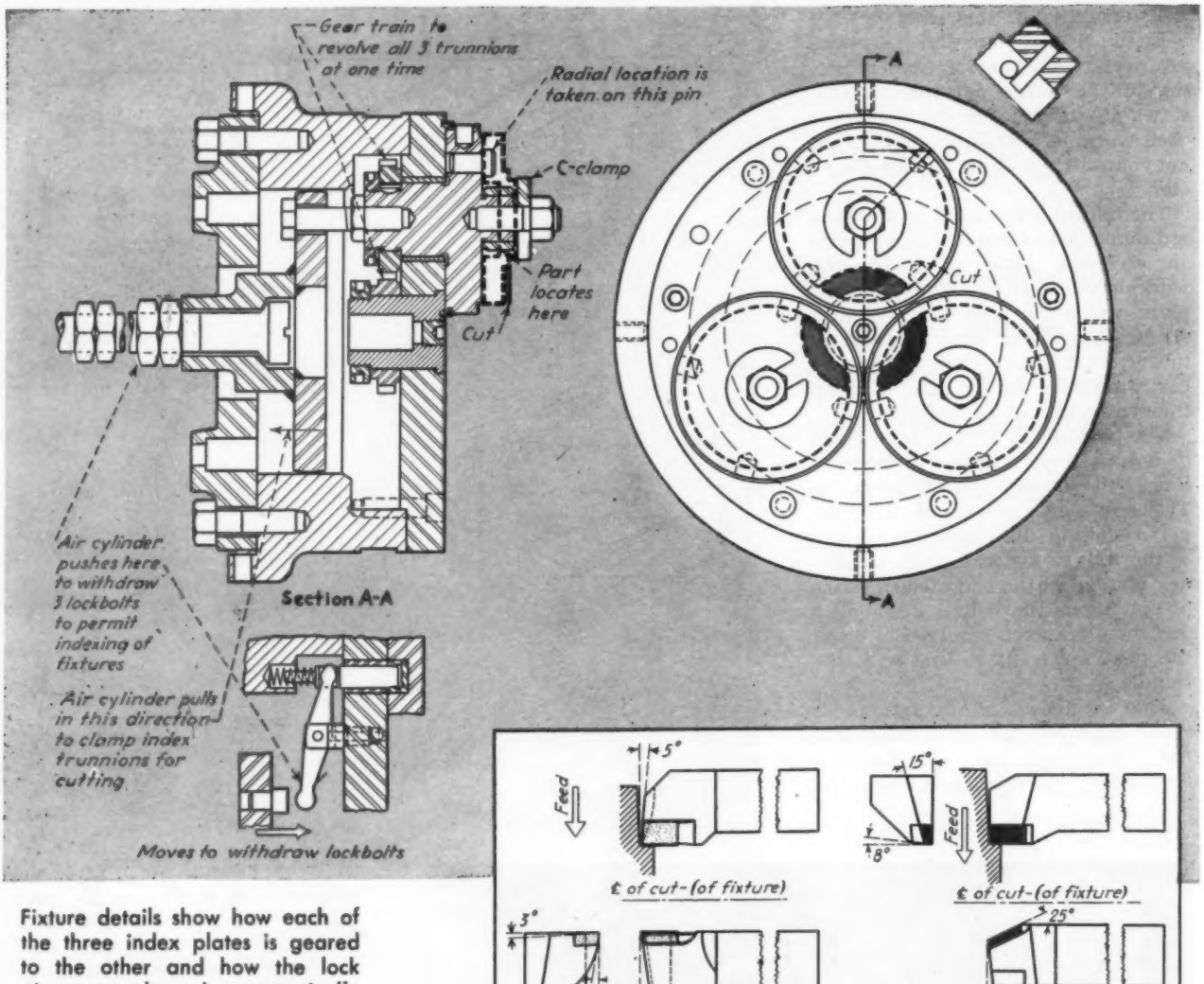
A diagrammatic sketch gives the sequence of machining for each pinion bearing bore and gear pocket. This series of cuts is used four times on each piece

The second set-up chucks three supercharger cages to machine the recesses between the holes

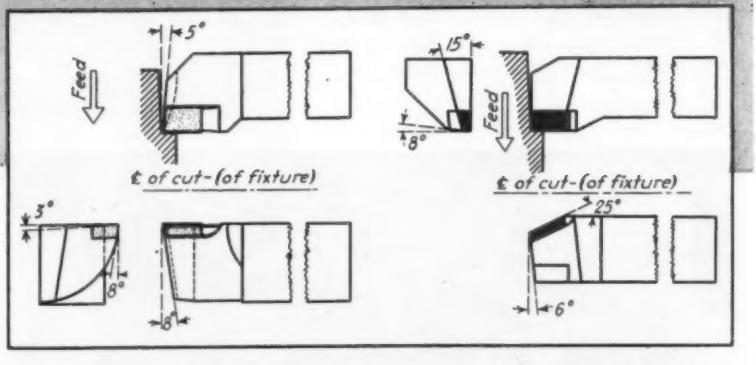
Of the six turret stations the tooling on three is of especial interest. Station 1 uses a dual cut drill which rough machines a 0.675 in. diameter and a 15/16 in. counterbore simultaneously. A special highspeed steel twist drill is employed.

Stations 2 and 3 use trepanning tool bits with carbon steel bodies and tungsten-carbide tips ground as shown in the accompanying sketch. The tools are alike, one being used for roughing and the other for finishing. Other operations follow conventional practice. A production of 22 parts in eight hours is obtained.

On the opposite side of the supercharger cage are four circular recesses midway between the holes just bored. One recess in each of three workpieces is machined at one


Gear train to revolve all 3 trunnions at one time
Radial location is taken on this pin
C-clamp
Part locates here
Cut
A
A
Cut
Air cylinder pushes here to withdraw 3 lockbolts to permit indexing of fixtures
Air cylinder pulls in this direction to clamp index trunnions for cutting
Section A-A
Moves to withdraw lockbolts

Fixture details show how each of the three index plates is geared to the other and how the lock pins are released pneumatically



The carbide-tipped roughing cutter has a radial clearance to suit the circular recess being machined. The finishing cutter also uses carbide but with a double negative rake

time. Here again the work is chucked off-center with the turret lathe spindle and is indexed four times to complete the cycle.

Each of the three parts is held on a revolving plate by means of a C-clamp and is located by its bore and one of the holes previously bored. The revolving plates are positioned and locked by means of taper pins which enter them from the back of the fixture. The pins are entered and withdrawn simultaneously through a plate that is actuated by a pneumatic draw bar which passes through a hole in the machine spindle.

In this case the tools are mounted in the square turret and consist merely of roughing and finishing cutters. The tools, however, are unusual. The roughing cutter has a circular clearance and a 3-deg. positive top rake. The finishing cutter employs a double negative rake. In both instances the tools have carbon steel shanks and brazed tungsten-carbide tips.

Limits required are bore diameter 0.005 in., depth 0.004 in., and chamfer 0.010 in. Again the surface finish must be within a Profilometer reading of 100, and this value is maintained consistently in production.

Cam Clamps Unadjustable for Irregular Sized Parts

By M. W. BOSSMAN

CAM OR FAST CLAMPS have a constant throw; that is, there can be no adjustment. Their use is limited to articles which are uniform in size, and for these they are well suited.

Castings or forgings, which vary dimensionally within wide limits, demand a clamp with a take-up capable of quick adjustment. Flat clamps held down by bolts are a suitable solution when the production run is not too great. However, for very large production, air cylinders are ideal, because the adjustment and clamping action are limited solely by the length of the piston stroke and the diameter of the cylinder.

Shims can be used under cam clamps, but this shows a lack of practical experience and is a wasteful process.

Practical Ideas

War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production

Master Arbor for Gear Cutter Uses Interchangeable Work Holders

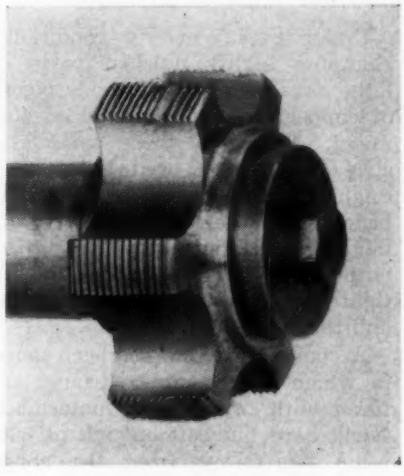
BY WILLIAM G. WINTERLING
Washington Navy Yard

Work spindles of gear generators have a tapered hole into which an arbor of either the solid type or with tapered inserts is placed. Sometimes these arbors are driven into position, or they are held by a drawbar. Frequent removal of such arbors causes wear on the tapered surface, and nicks on this surface affect concentricity. If tapered inserts are removed from an arbor, it is difficult to make them run true and keep them tight.

To overcome these troubles a master arbor was made, and is retained always in the work spindle, thereby eliminating damage to the tapered surface by frequent removals. This arbor is bored and ground to receive straight-shank inserts, or work holders. All work holders have shanks of the same diameter and length, and any nicks on the shanks do not affect concentricity. The head of the work holders varies in diameter and length to suit the gear blank.

To use, the proper work holder is inserted in the master arbor and drawn tight with a draw bar. Then the gear blank is located on the head of the work holder and fastened by means of a machine screw and special washer of the dished type.

Advantages of the combination of a master arbor and various work-holder inserts are cheaper production cost, easier and quicker changes in set-up, and elimination of damage to the work spindle. *Suggestion submitted under the Navy Employees' Suggestion Program.*



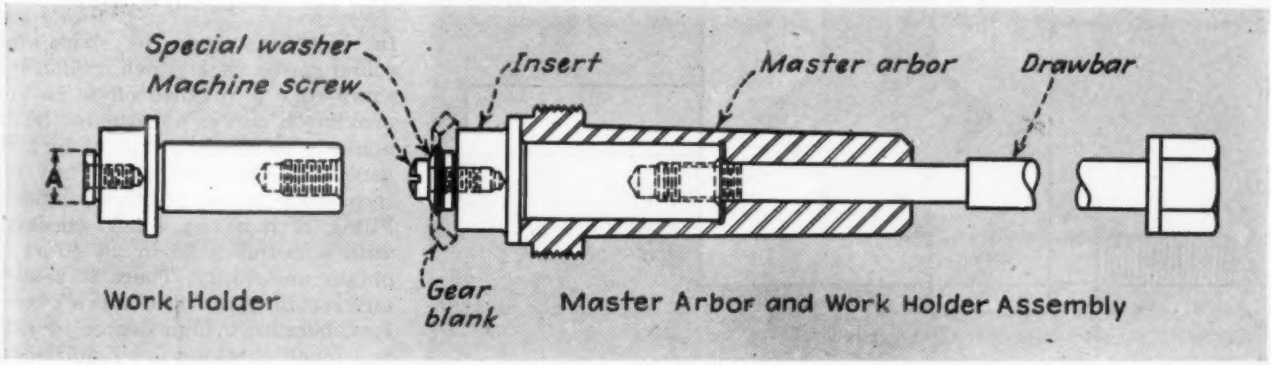
Step tap utilizes old thread as a lead to cut new thread

Stepped Tap Rechases Mutilated Threads

BY GEORGE AUBUCHON
Aircraft Engine Div., Packard Motor Car Company

Fine threads on large-diameter work are very difficult to start. Too often, crossed threads result, and each time the bolt is re-entered into the hole makes matters worse. To retap the hole to the same diameter and pitch of thread does not improve conditions. It is better to retap the hole to a slightly larger diameter and have good clean-cut thread to work with, guaranteeing satisfaction and a tight fit.

A step tap was developed in which the smaller diameter was the same as the original, but the larger, re-threading end, is of the same pitch. By its use, the tap can be aligned



Diameter A of the work holder is made to suit the hole in the gear blank. In use, the master arbor is kept in the work spindle, and the work holder is changed to suit the job, thereby reducing set-up time

in the damaged threads and serve as a lead for the new threads. The use of this tap has resulted in reclaiming 90 percent of damaged parts which would otherwise be scrapped. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Copper-Lined Lathe Dog Holds Finished Metal Parts Safely

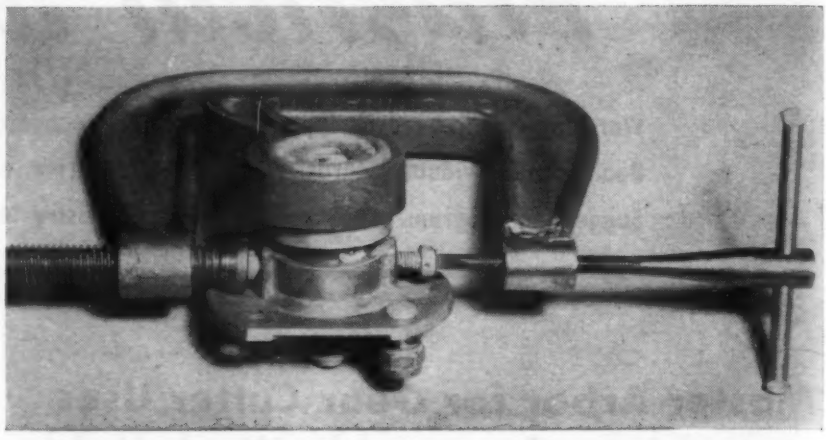
BY LEWIS W. SPAULDING

Under customary conditions, clamping highly finished parts in lathe dogs means hunting for pieces of copper, brass, lead or other soft metal. Normally, these soft-metal strips have been used before and might carry steel or iron chips embedded in their surfaces, which might result in scratches. Also, with such strips it is difficult to grip tightly enough to prevent slippage, and there will be distortion.

A clamp lathe dog has been made in which the gripping surfaces are faced with brass. This material is fairly hard, but soft enough to take some impression from the shape held.

The assembly can be welded or drop forged. All contact faces are covered by brazed brass which is finished to a uniform thickness after all other operations are completed.

With the soft metal permanently attached to the steel jaws, it is never necessary to use loose scrap copper or brass. Also, the dog can be tightened enough to carry any reasonable cutting load.



A C-clamp has been altered by brazing a nut to one leg and a threaded-shank screwdriver added. Constant pressure between the blade and the adjusting screw makes removal of an obstinate screw an easy task

Damaged Screws Removed by Follow-up Screwdriver

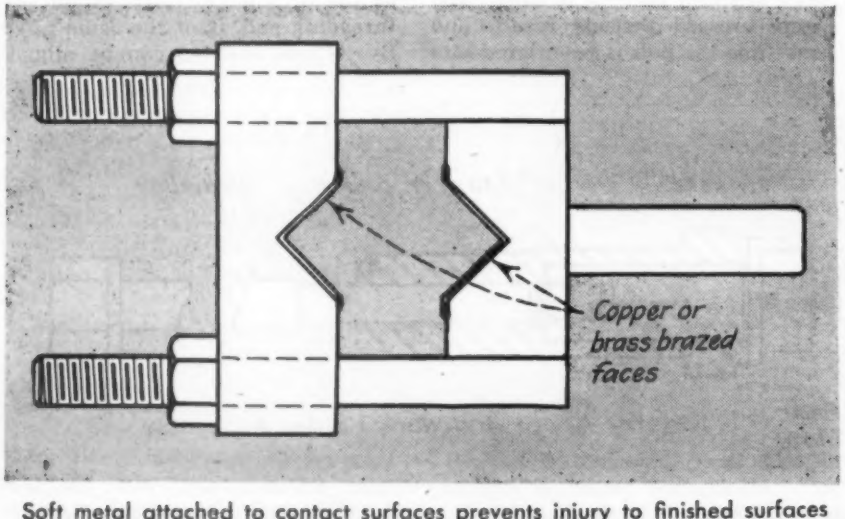
BY HENRY HOOTON
Douglas Aircraft Company, Inc.
Santa Monica, Calif.

The use of an ordinary screwdriver for removing screws with damaged heads usually causes more injury, because of the impossibility of holding the blade firmly enough in the slot to cause rotation. The principle of following-up one screw with another, so that a constant pressure between them can be maintained, has been used to advantage to hold the screwdriver in the slot.

A C-clamp has been modified so that a threaded-shank screwdriver turns in a nut welded to one arm while the pressure screw in the other arm has not been altered.

To use this screwdriver, the blade is placed in the mutilated slot, then adjustment of the pressure screw holds the blade in position. As the damaged screw is backed out, turning the pressure screw keeps the blade in contact. By maintaining pressure constantly, a very stubborn screw can be removed readily, because the blade cannot slip out of the slot and off the head. By the use of this screwdriver it is not necessary to drill out the old screw, remove remaining material and retap the hole.

This tool has been a time saver, in addition to preventing damage and rejection of the product. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Soft metal attached to contact surfaces prevents injury to finished surfaces and grips the work tightly enough to resist cutting loads

Accurate Radius Filing Obtained By Laying Out Gage Lines

BY MARVIN SMITH
Flour City Ornamental Iron Company,
Minneapolis, Minn.

In most instances, to shape the round corner of a punch or die, the sharp edge is roughed off to an approximate curve, no attempt being made to establish the point of tangency at either end, nor is any intermediate gaging position provided. Filing is done by hand, checking with a radius gage in an effort to obtain uniformity. There is seldom any certainty that the curve is correct, because a high degree of skill and much checking are required.

By the use of some mathematics, a marking gage and a radius gage, it

is possible to file a corner accurately and quickly.

For any angle between the sides, 180 degrees minus the included angle will give the center angle *A*. The diagram shows the significance of the symbols used in the formulas.

The following formulas can be used for any corner angle—

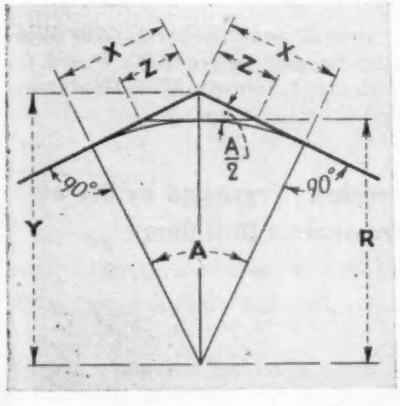
$$X = R \tan \frac{A}{2}$$

$$Y = R \div \cos \frac{A}{2}$$

$$Z = (Y - R) \div \sin \frac{A}{2}$$

With the radius and the corner angle known, by substituting these values in each equation in turn, the correct distance from the sharp edge can be obtained. From handbooks, the various angles can be obtained without any trouble.

By setting the marking gage to the distance *X*, a line is scribed which marks the point of tangency



The point of tangency and the flat for any corner angle can be found by the use of this diagram and the accompanying formulas

of the curve; similarly, the distance Z is scribed.

Solutions, for commonly used corner angles, are listed below

For 60 degrees, the center angle is 120 degrees and

$X = 1.732R$, $Y = 2R$, $Z = 0.577R$

For 90 degrees, the center angle is 90 degrees and

$X = R$, $Y = 1.414R$, $Z = 0.585R$

For 120 degrees, the center angle is 60 degrees and

$X = 0.577R$, $Y = 1.154R$, $Z = 0.309R$

In the above formulas, in place of the corner radius *R* put its actual value and perform the necessary multiplication.

For a 90-deg. corner angle, a center square can be used to check the distance $Y - R$ by setting the blade to this value.

Planing or shaping off the sharp

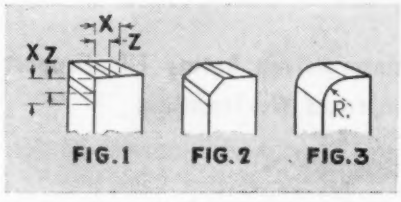


Fig. 1—Scribe the point of tangency X and the distance Z for cutting the flat. Fig. 2—Shape off the sharp corner to the distance Z. Fig. 3—Using the distances X and the flat for gaging, a round corner is filed quickly

edge to a flat for the distance *Z* on each side leaves very little metal to be removed with a file; this flat is perpendicular to a line drawn from the center of the curve to the sharp corner and the radial line bisects the corner and center angles.

To increase the usefulness of this method, a chart for various corner angles can be assembled and the multiplication for many radii can be done for each case; if only 90-deg. corners are to be considered, then a tabulation for numerous commonly used radii can be compiled.

This system simplifies checking and a man can do good work more quickly than by using the customary method. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Universal Fixture for Bending Bar Stock to Shapes

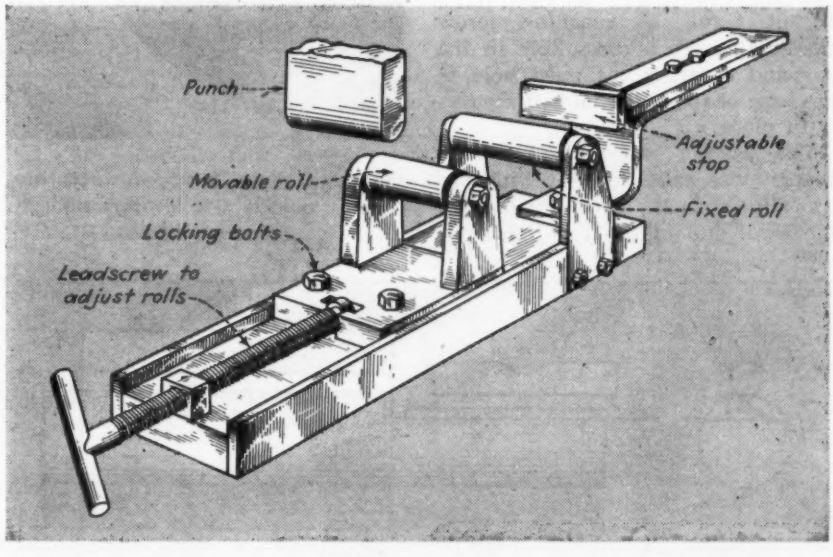
BY E. P. BRISCOE
Kaiser Company, Inc., Portland, Ore.

Punches and dies for forming simple or compound shapes of bar stock are expensive. Much time and material are consumed designing them, pattern charges pile up, the costs of foundry and machine shop work must also be taken into account plus storage of patterns and dies. When tools like these are on hand, they cannot be promptly adjusted for some minor change in dimensions.

An adjustable bending fixture has been designed which has broad applications to forming bar stock in an infinite number of types of bends within its capacity.

It consists of a bed to which a roller is fixed in position in a rigid support and a movable roller support capable of being adjusted to different center distances with respect to the fixed roller. This bed, with its rolls, is placed on the bolster or platen of the press.

A punch, or male die, is fastened to the ram or slide. Under certain conditions and for very large bends,



Two rollers, one of which is adjustable, and a punch make bending bar stock into curved shapes a simple matter for one fixture

a different punch might be required.

At one end of the bed, an adjustable gage or stop is used to locate the position of the bend, the other end has a large screw for shifting the movable roller.

Material can be cut to length, laid upon the rollers, put in contact with the gage, the treadle pressed and the shape bent true to dimensions, without the tendency to change sectional area at the bend, because the rollers offer very little resistance.

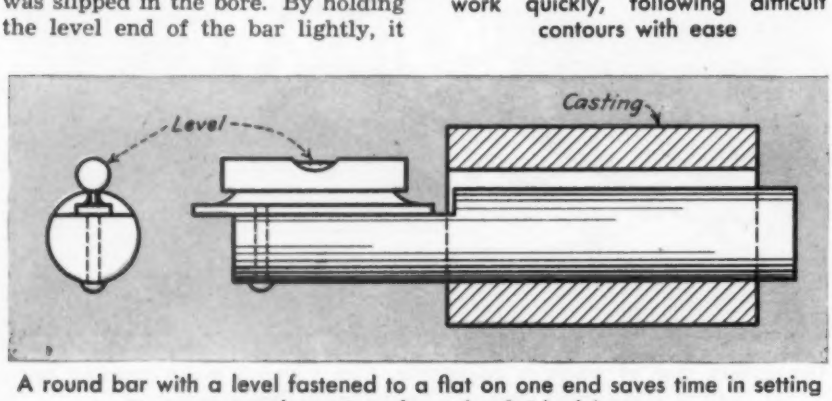
The result has been more uniform and stronger bends, time, storage and material reduced to a minimum, very little spoilage and general overhead reduced substantially. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Leveling Bar Aids Set-Up of Bored Castings on Shaper

BY DONALD R. TRYER

Alignment of rough castings in a shaper vise by trial-and-error methods requires too much time, especially when the cutting tool must be aligned with a finished bore for cutting an internal keyway. For a job involving a number of pieces, set-ups were expedited by the use of a leveling bar. This was a machined bar about ¼ in. less in diameter than the bore in the part, and about 6 in. longer than the bore. A flat was milled at one end of the bar to receive a small bench or pocket level. A machine screw passed through a cross hole in the bar and entering a tapped hole in the base of the level holds it securely in place.

The casting was placed in the shaper vise, and the leveling bar was slipped in the bore. By holding the level end of the bar lightly, it was easy to tell by the feel whether the bar was in continuous contact with the bottom of the bore. Then by adjustments of the casting in the vise, the bore was set level. Of course, care was exercised not to close the vise jaws on high spots on the casting, to avoid throwing the bore out of line sideways with the cutting tool. Employment of this cutting tool.



A round bar with a level fastened to a flat on one end saves time in setting up rough castings from the finished bore

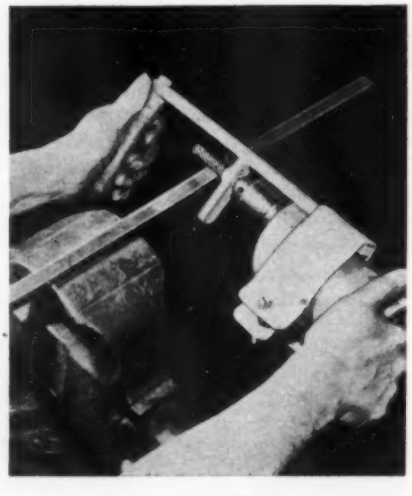
Motor-Driven Rotary File Support Improves Workmanship

BY JAMES MORRISEY
Republic Aviation Corporation
Farmingdale, L. I.

When motor-driven rotary files are used, the possibilities of producing flat surfaces are remote, because of machine vibration and the inability to maintain the file position.

By clamping a substantial bar to the motor and having an additional support close to the chuck, a handle on the free end of the bar adds stability to the operation. Filing surfaces flat can be accomplished quickly and accurately by holding the motor grip in one hand and the handle in the other, then passing the file over the surface uniformly. With both hands directing the motion of the file, good surfaces should be produced.

This attachment assists the worker to remove metal quickly and follow contours which would require plenty of time if done by hand. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Rotary files produce accurate work quickly, following difficult contours with ease

Have You a Practical Idea?

. . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. Thus the plowback of experience will promote progress and prevent repetition of past errors. But be certain your idea is really practical—no day dreams or untried whimsies are wanted. We pay for contributions prepared exclusively for this publication.

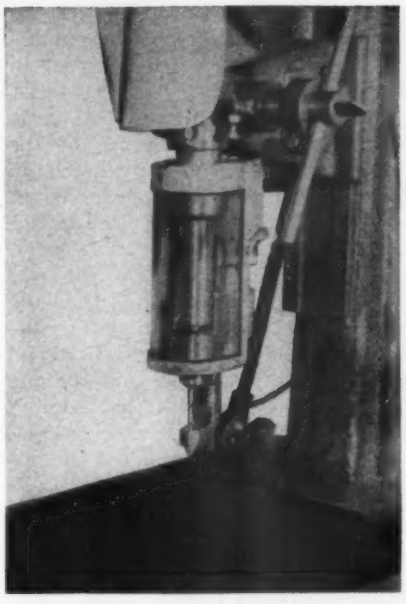
Accidents Prevented by Use of Transparent Drill Guard

BY M. T. McNAMEE
Douglas Aircraft Co., Inc.
Santa Monica, Calif.

Many machine operators are not aware of the accident possibilities of the machines they operate. For those who have loose clothing and long hair, the risk is much greater because of static charges built up by rapidly moving parts. This static charge attracts human hair; also, stray strands of clothing have a habit of getting into machinery unless it is very closely guarded from such occurrences.

Glass guards have proved too great a hazard, and the material does not lend itself to forming. Until transparent plastics came into existence, wire mesh was the best material available. Transparent plastic sheet, because of its elasticity and resistance to shock, can be applied for windowed guards on machines.

A transparent guard has been



Transparent guards, metalbound, are effective in preventing accidents

built about the chuck of a high-speed drill to prevent chips from flying or hair and fingers from becoming entangled in the rotating parts. The guard is stiffened with metal binding. Because of its transparency, operations behind the shield are visible at all times. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Good Grip and More Force Applied With Extra Handle on Large File

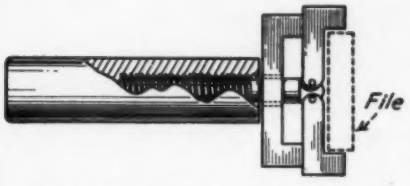
BY O. N. EDWARDS
Moore Dry Dock Company, Oakland, Calif.

Filing iron or steel is quite a task, especially if the work is large, much material must be removed and the file is long and heavy. Handles on the tang are regularly supplied, but seldom is there a grip of any kind for the tip of the file. In consequence, fingers are cut, the hand is bruised and much downward force must be exerted to make the file take a good bite into the metal.

A handle has been made which grips the sides of the tip of the file firmly, yet gives freedom of movement in any direction. Construction is simple. Two jaws are fastened to a stud at the center and supported by a channel-shaped bridge through which the stud passes. A handle is tapped to screw on the stud.

Fastening the handle on the tip of the file is a case of placing the jaws over the sides and screwing the grip until solid. Changing from side to side of the file or from one file to another requires loosening and tightening the grip.

With this type of handle, the fingers and hand are always clear of the cutting surface and plenty of



Extra handle on tip of file saves fingers from injury and permits more work with less effort

pressure can be aplied to take good clean strokes for removing metal. Thus much more work can be done with less effort and a better control *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Puller for Small Bearings Removes Sleeves Without Damage

BY R. S. FOSTER
Machinist Foreman, Kaiser Co., Inc., Portland, Ore.

Bearing sleeves pressed into small bores are difficult to remove for inspection. Formerly, the sleeves were punched or chiseled out, giving rise to damage and taking much time.

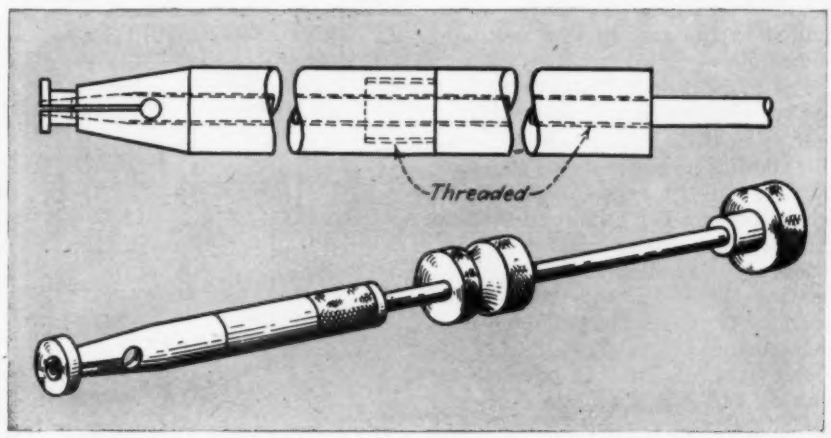
To overcome this difficulty, a small puller has been made. This device has a shoulder to bear against the inside edge of the bearing. The attachment is made so that when it is contracted, the flanged end will clear the bearing bore, but when expanded, the flange contacts the inside end of the bearing sleeve. The idea is similar to a push-out collet used to grip the inside of tubes or rings while machining operations are done on the other surfaces.

A detachable, split-skirt flange is made with its inside bore tapered at the flanged end; otherwise there is a straight drilled hole through it. The large end is tapped to fit the threaded part of the body. The body has a tapped hole to accommodate the expanding rod and this expanding rod has a hammer sliding along its exposed length: there is a knob on the free end of the rod, but the other end is tapered.

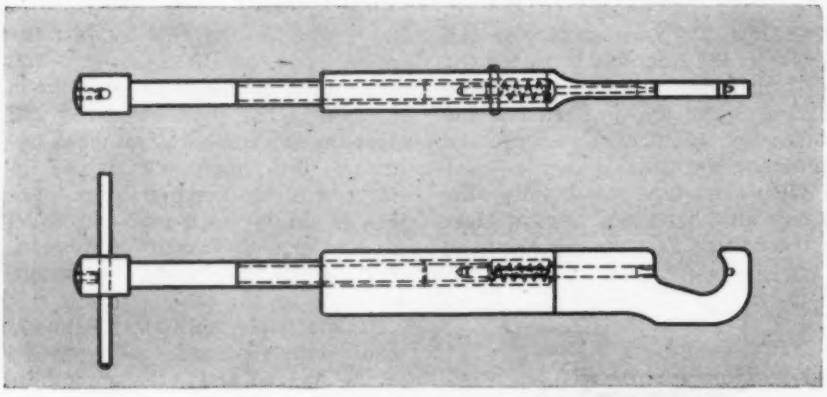
Contracting the split end is done by turning the knob counterclockwise until the shouldered end enters the bearing, after which clockwise rotation of the knob expands the shouldered end until it fits the bore tightly. Sliding the hammer along the rod until it taps the knob smartly will start the bushing from its housing without injury.

For different bores of bearings, other sizes of split ends are necessary. Replacement is just a case of unscrewing the body from the split end and putting on the correct size.

Motor bearings can be pulled with the minimum of effort or injury, showing a saving of time and materials which is worth while. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Small bearings are no problem to this puller which does not cause injury to the sleeve and is quick in action



This pusher removes pins without the possibility of bending the shaft or damaging the pin through small hubs and shafts

Pusher Removes Small Pins Without Bending Shafts

BY MILFORD GOESSLING
Ford Instrument Co., Inc.
Long Island City, N. Y.

Instruments are rather delicate; gears, and shafts must be small, because of limited space and the necessity for reducing inertia due to the minute forces involved. Because of small shafts, keys cannot be used to connect mechanical parts, so pins through hubs and shafts are mandatory. If there are instances where these pins must be taken out, and the space is limited, driving is likely to bend the shaft, resulting in expensive replacement.

This difficulty has been overcome by making a slender J-shaped pressing tool to reach into cramped spaces, yet sturdy enough to press out pins.

The jaw which partly embraces the hub is made narrow to enter small spaces and fit on short hubs without interfering with adjacent mechanism. A shallow hole, a trifle larger than the pin diameter, is drilled in the jaw in line with the body hole.

The main body is drilled throughout its length. At the jaw end, the hole is small to take the pusher and this rod has its end reduced in diameter to suit the size of pin to be worked upon. The other end fits into the larger diameter pressure screw. There is a small ball for a thrust bearing between the screw and pusher. The pusher is retracted by a helical spring.

Removal of pins is effected by placing the jaw about the hub and turning the screw until the pusher is directly over the pin. Further movement of the screw gently pushes the pin until it bottoms in the hole in the jaw. If the hole in the jaw is deep enough so that the pin remains in one side of the hub, it is possible to remove the piece from the shaft and use the pin again. This tool saves much time. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

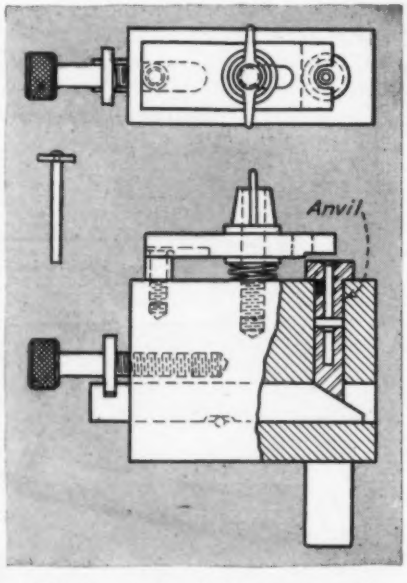
Fixture Holds Washer and Pin Square While Riveting

BY M. W. BOSSMAN

We were recently confronted with the problem of riveting a washer square with a pin having a narrow shoulder. For this job we made the fixture shown.

A rectangular block of steel has a sliding wedge, controlled by an adjusting screw, to move the pin anvil vertically. A bushing is set in the upper face of the fixture body, directly in line with the pin anvil. A clamp is placed on top of the body, a heel pin holds the clamp level and a spring supports it. A stud with a wing nut is used to apply pressure for holding the washer.

In using the fixture, the pin was first placed in the bushing, then the washer was located on the pin shoulder. The clamp was brought down tightly on the washer, and the pin anvil adjusted until the shoulder of the pin firmly supported the washer. Peening the head completed the operation in minimum time.



With the washer held square to the pin, riveting can be done without risk of spoiling the assembly

Hose Fittings Crimped by Use of Hand-Operated Pliers

BY M. C. OTOS
California Shipbuilding Corporation

When air or water hose must be renovated, because of wear or looseness of couplings, a trip to the hose shop is usually necessary. This method requires a crimping machine.

To do repair work in the field, a hand crimper, made from light steel plate, has been made. Each side is made of two thicknesses of plate, with spacers between, so that the jaws interlock. In each jaw are two openings arranged to receive the fittings, when the pliers are open, and squeeze the sleeves into the hose surrounding the fittings, when the jaws are closed.

Crimping pliers made of four pieces of sheet steel burned to shape and welded together make a portable crimper for hose fittings

By use of these portable pliers, a damaged hose can be repaired on the spot. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

SELECTION AND APPLICATION OF *Fastening* DEVICES

SELECTION of the proper fastening device depends on the service conditions to be met in addition to economic factors governed by local and individual shop conditions. It is easy to provide too good or too poor a fastener for the units being assembled. Screws are used sometimes when nails would be entirely satisfactory and vice versa, or bolts larger or smaller than necessary are provided. Using fasteners that exceed requirements by too large a margin is false economy, just as the use of devices that do not meet minimum requirements violates the rules of safety and gives poor quality in the finished product.

Fasteners are sometimes used as location points in addition to performing their function of fastening. This is often the case with studs where the location of the studs indicates what parts are to be fastened to them.

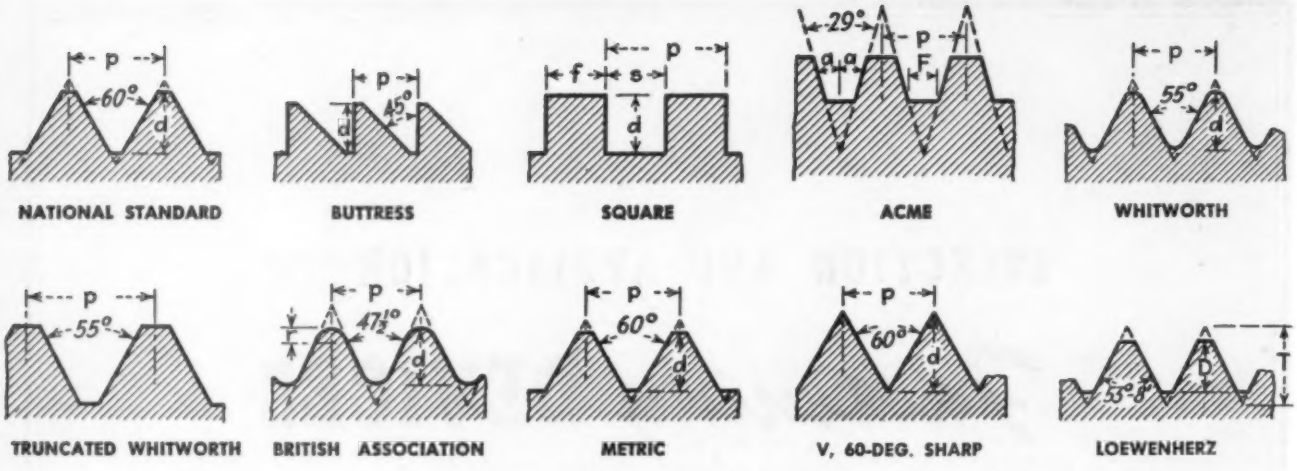
All bolts, nuts and screws and most studs depend on threads for their fastening action. Some washers and a few special types of rivets also are threaded. Inserts generally incorporate threads although they are sometimes notched or left plain.

Other fastening devices depend on spring tension for their holding action. Examples of these are lock washers and quick-access fasteners. Studs that are notched instead of threaded also fall into this category.

Some fasteners combine both threads and spring tension. This is particularly true of some lock nuts and lock bolts.

Due credit is given these organizations for data on which the material in this section is based:

Adel Precision Products Corp.
Aerotight Locknut Co.
Aircraft Screw Products Co.
Allen Mfg. Co.
Aluminum Co. of America
American Institute of Bolt, Nut & Rivet Manufacturers
American Marsden Co.
American Screw Co.
American Standards Asso.
An-Cor-Lox Div., Laminated Shim Co.
Automatic Nut Co.
Automatic Screw Machine Products Co.
Bardwell & McAlister, Inc.
Blake & Johnson Co.
Boots Aircraft Nut Corp.
Bristol Co.
Camloc Fastener Corp.
Cherry Rivet Co.
Cleveland Pneumatic Tool Co.
Columbia Nut & Bolt Co.
Continental Screw Co.
Corbin Screw Corp.
Dardelet Threadlock Corp.
Davis Developments
Douglas Aircraft Co.
E. I. du Pont de Nemours & Co.
Dzus Fastener Co.
Eastern Machine Screw Corp.
Elastic Stop Nut Corp.
FabriSteel Products, Inc.
Fibre Lock Nut Corp.
B. F. Goodrich Co.
Greenfield Tap & Die Corp.
H. M. Harper Co.
John Hassall, Inc.
Holo-Krome Screw Corp.
Industrial Screw & Supply Co.
Lamson & Sessions Co.
Lewis Bolt & Nut Co.
Mac-it Parts Co.
Manufacturers Screw Products
Glenn L. Martin Co.
National Machine Products Co.
National Screw & Mfg. Co.
North American Aviation, Inc.
Nutt Shell Co.
Palnut Co.
Parker-Kalon Corp.
Pheoll Mfg. Co.
Place Cap Screw & Bolt Co.
Preco, Inc.
Progressive Mfg. Co.
Reliance Spring Washer Div., Eaton Mfg. Co.
Remington Screw & Bolt Mfg. Co.
Russell, Birdsall & Ward Bolt & Nut Co.
Security Locknut Corp.
Shakeproof, Inc.
Simmonds Aerocessories, Inc.
Simlok Div., Simmons Machine Tool Corp.
Standard Pressed Steel Co.
Stover Lock Nut & Machinery Co.
Strong, Carlisle & Hammond Co.
Talon, Inc.
Thorrez & Maes Mfg. Co.
Tinnerman Products, Inc.
United Screw & Bolt Corp.
United-Carr Fastener Corp.
Victory Mfg. Co.



Standard and typical special thread forms

THREADS

Because so many fastening devices incorporate screw threads, anyone who uses or specifies fasteners should be familiar with screw-thread terminology. The basic terms used for standard screw threads are defined and explained in "Commercial Standard CS24-43, Screw Threads and Tap-Drill Sizes," published by the National Bureau of Standards.

The two types of thread series common to threaded fasteners in the United States are National fine and National coarse. There is also an extra-fine thread series. In addition, various special thread forms are used for special applications.

The British Whitworth thread has become generally familiar to American industry. The major difference between the Whitworth and American threads is that the former has a thread angle of 55 deg. and the latter has a thread angle of 60 deg. Recent conferences between representatives of both countries and Canada have been aimed at establishing a common international standard for screw threads. The result of these conferences to date is summarized in a "Report of Conferences on Standardization of Screw Threads and Cylindrical Fits."

FITS

A fit is the relation between two mating threaded parts with reference to the conditions of assembly. Five classes of fits are now standard for screw threads. According to Commercial Standard CS24-43, referred to above, the first four types of fits are defined as follows:

"Class 1 fit, loose, includes screw-thread work in which the threads must assemble easily, and where an allowance is required to permit ready assembly, even when the threads are slightly bruised or dirty.

"Class 2 fit, free, represents a high quality of commercial screw-thread product and is recommended for the major portion of interchangeable screw-thread work, finished and semi-finished bolts and nuts, machine screws, etc., where no allowance is required.

"Class 3 fit, medium, is the same in every particular as class 2 fit except that the tolerances are smaller. The Class 3 fit is intended to apply to interchangeable screw-thread work requiring the smallest practicable tolerances. Tapped holes within Class 3 tolerances are difficult and expensive to produce commercially.

"Class 4 fit, close, is designed for screw-thread work where extremely close tolerances are required. In the manufacture of screw-thread products to this class of fit, it will be necessary to use precision tools, gages made to special tolerances, and other requirements. This class of fit should, therefore, be used only where the requirements of the mechanism being produced are exacting, or where there are special conditions which make this class of fit necessary. To insure assembly with the degree of tightness desired, it may be necessary, in some cases, to select the parts when the product is being assembled."

Class 5 fit, wrench, represents the closest fit possible, from a practical standpoint. A wrench is necessary to turn parts with screw threads that have this class of fit.

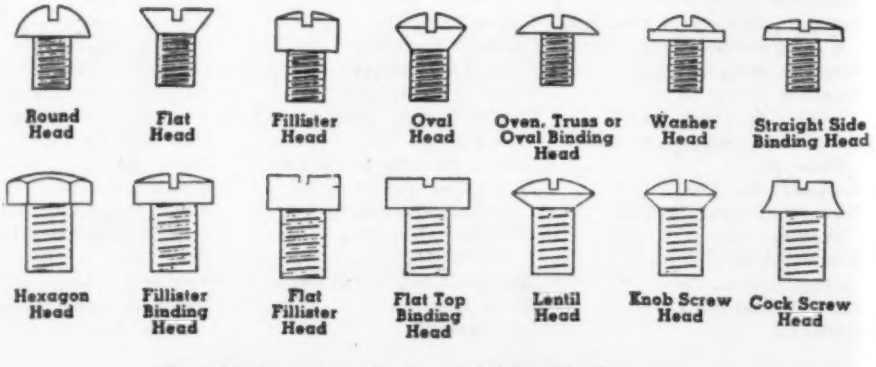
MATERIALS OF MANUFACTURE

Bolts, nuts and screws are made from a wide variety of materials. These include:

Carbon steels ranging from SAE 1010 to SAE 1065.

Free-cutting steels — Generally low-carbon steel high in sulphur, including Bessemer steels. Strength and uniformity of these materials are generally not as high as that of low-sulphur open-hearth carbon steels.

Manganese steels — SAE-T1335.



Standard and typical special heads for screws

This material, containing 1.60-1.90 manganese, is stronger and tougher than the conventional carbon steels.

Nickel steels—Used for highly stressed bolts and studs.

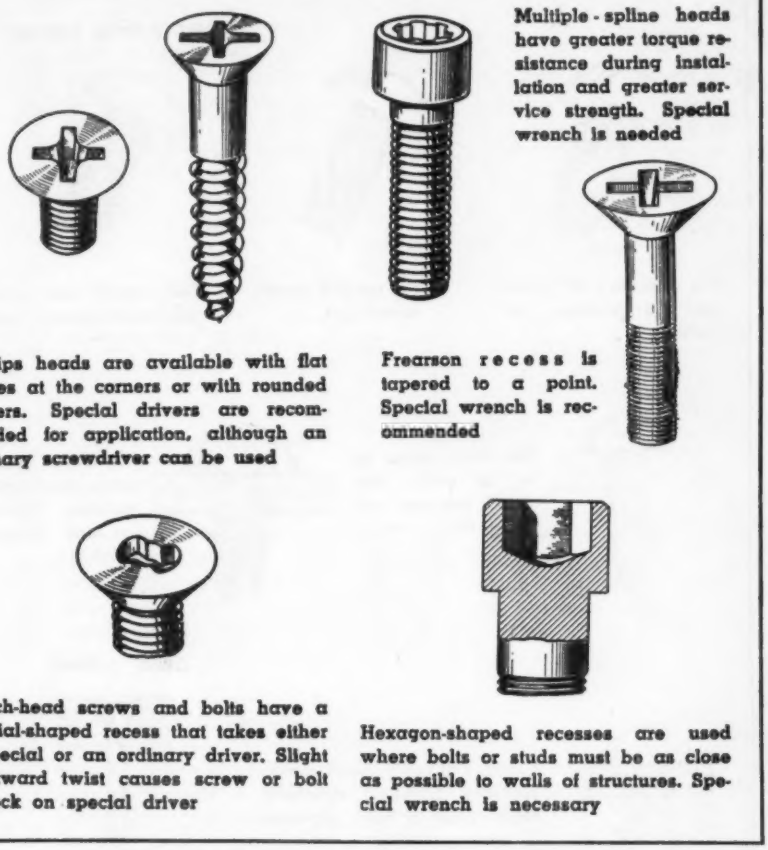
Molybdenum steels—Particularly suited for highly stressed bolts in high-temperature service.

Chrome-nickel and chrome-vanadium steels—For applications where high strength and fatigue resistance are required.

Stainless steels—Numerous types are available, although only a relatively few are used for making fastenings. They are used principally for corrosion- and heat-resistant applications. The popular types are straight chrome stainless steels, which contain 13-17 percent chromium, and 18-8, which has 18 percent chromium and 8 percent nickel. Other types that may be used for special applications include chrome-nickel-moly stainless, containing 18 percent chromium, 12 percent nickel and 2 percent molybdenum, which is especially noted for resistance to galvanic action and has superior corrosion resistance; stabilized austenitic stainless steel, consisting of chrome-nickel stainless steels with a small amount of columbium or titanium, for service in critical temperature ranges; 17-2, which contains 17 percent chromium and 2 percent nickel, particularly useful in marine service because of its resistance to galvanic corrosion; copper-bearing stainless steel, containing 20 percent chromium and 1 percent copper; and creep-resistant stainless steels, which include many of the chrome-nickel-moly family.

Brass, bronze, aluminum and other non-ferrous materials are used for applications where corrosion resistance or light weight rather than great strength is needed.

Plastic bolts recently have become available. These are molded from cord-filled phenolic material and are especially notable for their light weight. One of their uses is as tie-down and mooring fittings in aircraft.



Phillips heads are available with flat planes at the corners or with rounded corners. Special drivers are recommended for application, although an ordinary screwdriver can be used

Multiple-spline heads have greater torque resistance during installation and greater service strength. Special wrench is needed

Frearson recess is tapered to a point. Special wrench is recommended

Clutch-head screws and bolts have a special-shaped recess that takes either a special or an ordinary driver. Slight backward twist causes screw or bolt to lock on special driver

Hexagon-shaped recesses are used where bolts or studs must be as close as possible to walls of structures. Special wrench is necessary

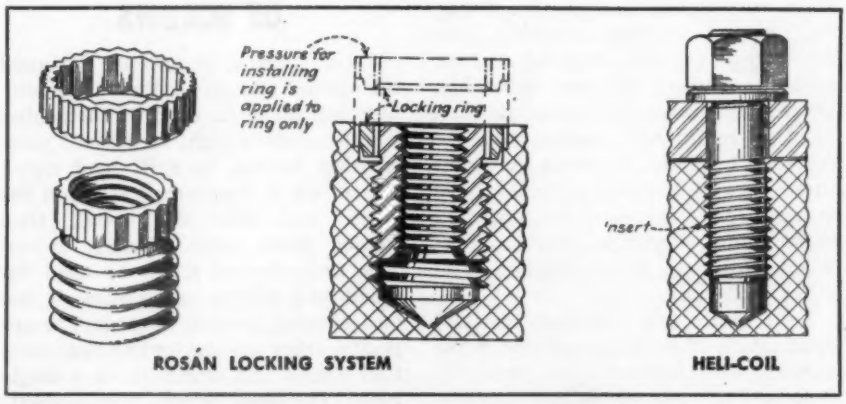
Recessed heads for screws and bolts

HEADS AND RECESSES

Bolts, and some types of screws such as machine screws, usually have square or hexagonal-shaped heads. Occasionally the heads are cylindrical with a knurled perimeter for hand assembly.

Other screws have round heads that are flat or domed to various degrees. Recessed head bolts need less clearance for wrenches and can be countersunk so that they are nearly unnoticeable. However, there may be less bearing surface under the head, especially if the bolt is countersunk.

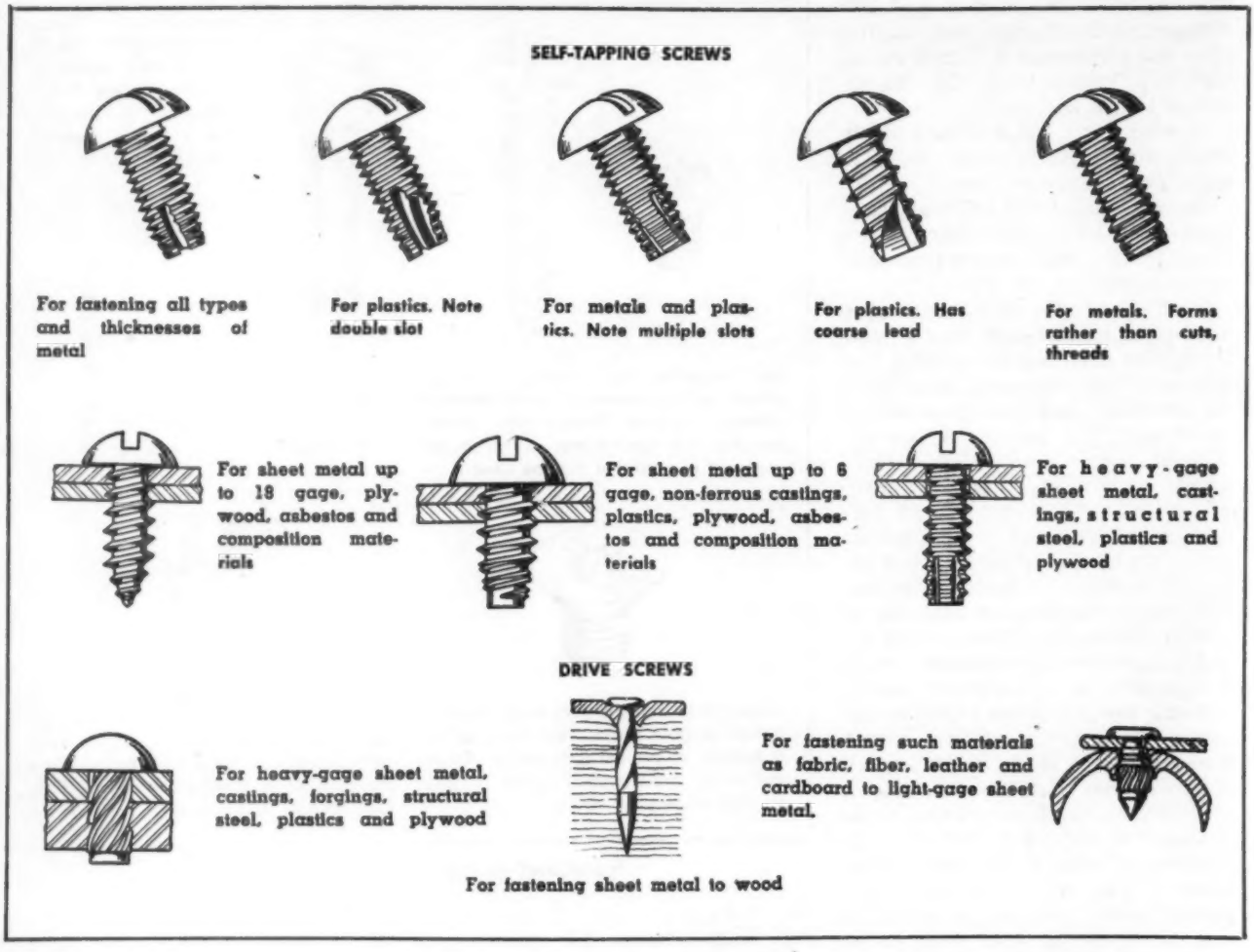
Recesses in screws have several advantages. From the production standpoint, they hold the driver centered on the head of the screw and keep it from sliding out of a slot. Recessed head screws also are usually stronger than slotted types, especially if they are formed by cold forging which gives controlled grain flow. Under applied load, stress concentration in the head is minimized by the shape of the recess.



Special stud-type fastenings

STUDS

Studs are sections of bar stock that are driven or turned into various materials such as steel, brass, aluminum, zinc die-castings, plastics or compressed blocks of wood fibers. When the stud is driven into place, a hole slightly smaller than the diameter of the stud is held by the friction grip of the undersized hole. If the stud is threaded into a tapped hole the thread on this section is usually of different pitch from that


SELF-TAPPING SCREWS
For fastening all types and thicknesses of metal
For plastics. Note double slot
For metals and plastics. Note multiple slots
For plastics. Has coarse lead
For metals. Forms rather than cuts, threads
For sheet metal up to 18 gage, plywood, asbestos and composition materials
For sheet metal up to 6 gage, non-ferrous castings, plastics, plywood, asbestos and composition materials
For heavy-gage sheet metal, castings, structural steel, plastics and plywood
DRIVE SCREWS
For heavy-gage sheet metal, castings, forgings, structural steel, plastics and plywood
For fastening such materials as fabric, fiber, leather and cardboard to light-gage sheet metal.
For fastening sheet metal to wood

Types of self-tapping and drive screws

on the holding end to provide holding by differential-thread action; or the thread may be of opposite hand.

Studs can be plain, threaded or notched. If they are threaded, nuts can be turned on them; if notched or plain, spring-tension fasteners can be held in place.

Special stud-type fastenings are available for materials or types of construction that do not lend themselves to tapping for the application of screws.

One such device is a threaded-in insert for plastics, plywood, wood and metals where a replaceable insert is desired. The hole is tapped to receive the insert and the locking ring is driven into place with a special tool. The inner surface of the insert is threaded to take standard screws. The serrated outside edges of the locking ring keep the assembly from turning in the material.

Another special insert is used for fastening high-strength studs or cap screws in aluminum, magnesium or other soft material. The metal insert is screwed into the tapped hole with a special tool and a threaded stud is then screwed into the insert.

SELF-TAPPING AND DRIVE SCREWS

In assembling component parts it is frequently impossible to apply nuts to bolts because one side of the work may be blind. Then, too, it may be desirable to keep assembly time as short as possible, making a more quickly applied fastener desirable. Or perhaps dissimilar materials such as sheet metal and plastics must be fastened together. For such instances there are self-tapping and drive screws. These are used for fastening sheet metal, castings, plastics, plywood, fabrics, fiber, leather and other materials.

Lead holes are necessary for the application of self-tapping and drive screws. The former have specially designed threads for different applications and are available in all standard head forms, either slotted or with a recess. Drive screws, sometimes called screwnails, are usually self-tapping and are driven with a hammer. They have greater holding power than ordinary nails and in some cases can be backed out with a screw driver.

SPECIAL TYPES OF SCREWS

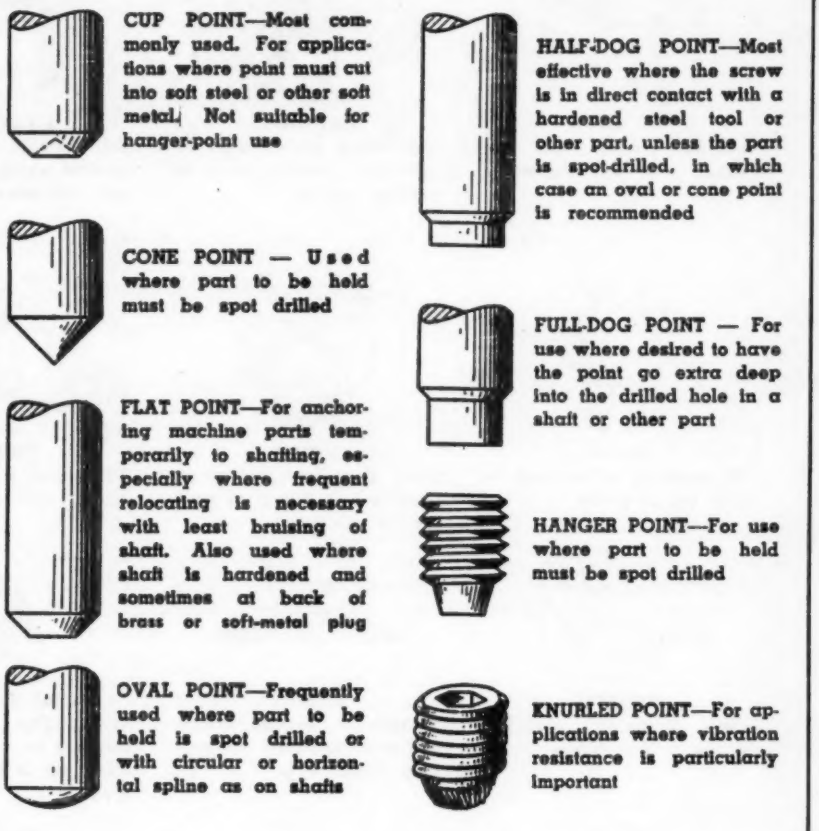
Other types of screws are designed for special situations. Thus, the self-piercing screw is used for attaching wood panels to light structural parts without having to drill lead holes. The screw is hammered through the wood and into the metal, then turned down with a screw driver. The twin-thread screw is used for wood and plastic assemblies. It has two parallel threads that start at opposite sides of the cylindrical-contour shank and terminate in a single point. The twin threads give a greater bearing area than a single thread.

Self-piercing screw

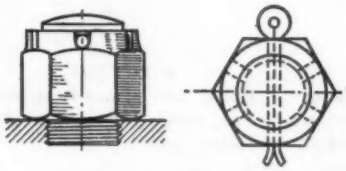
Twin-thread screw

MACHINE, SET AND CAP SCREWS

For fastening elements of machines, machine screws, setscrews and capscrews are the most widely used types. Machine screws are often threaded the full length of the shank and are usually applied with a screw driver. Capscrews have square, hexagon or knurled heads and are usually threaded for only part of the shank. Setscrews are threaded for the length of the shank. They can be either headed or headless. Many types of setscrews have a square, hexagon or splined recess for application. Their purpose is to hold a tool or some other element of a machine in a precise setting. Various types of points, many of which are shown in the accompanying illustration, are provided on setscrews for different purposes.


CUP POINT—Most commonly used. For applications where point must cut into soft steel or other soft metal. Not suitable for hanger-point use
CONE POINT — Used where part to be held must be spot drilled
FLAT POINT—For anchoring machine parts temporarily to shafting, especially where frequent relocating is necessary with least bruising of shaft. Also used where shaft is hardened and sometimes at back of brass or soft-metal plug
OVAL POINT—Frequently used where part to be held is spot drilled or with circular or horizontal spline as on shafts
HALF-DOG POINT—Most effective where the screw is in direct contact with a hardened steel tool or other part, unless the part is spot-drilled, in which case an oval or cone point is recommended
FULL-DOG POINT — For use where desired to have the point go extra deep into the drilled hole in a shaft or other part
HANGER POINT—For use where part to be held must be spot drilled
KNURLED POINT—For applications where vibration resistance is particularly important

Types of set-screw points



CASTELLATED NUT AND COTTER PIN

SLOTTED NUT

COOKE-MICRO SLOTTED NUT

This is a special design of castellated, the slots being arranged so that there are 14 to 22 locking positions

Slotted and castellated nuts

NUTS AND BOLTS

Nuts are either square or hexagonal, but in rare instances they may have more than four or six sides and occasionally they are round with a knurled perimeter. Three thicknesses are standard—regular, heavy and light. Some nuts are slotted and others have a castle section added to the top surface. In both instances the slots, which can have either sharp-cornered or rounded bottoms, are for the purpose of inserting cotter pins to keep the nut from working off the bolt. A special type of this nut has the slots arranged so that there are 14 to 22 locking positions, allowing a more precise adjustment before the cotter pin is inserted. Standard nuts have flat, washer or chamfered bearing surfaces.

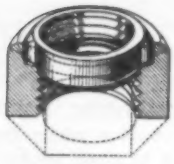
Bolts also have square- or hexagon-shaped heads, like nuts, or recessed heads like those used in recessed head screws.

WASHERS

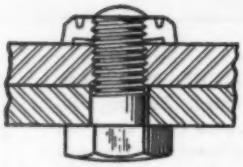
Because the bearing surfaces of nuts, and screw and bolt heads, are relatively small these devices tend to draw or bite into soft materials such as plastics when they are tightened. To relieve this condition, at least to some extent, there are various types of standard washers that are merely flat disks with holes in the center to fit over the shanks of bolts. Special types of washers are deformed in various ways to provide a locking action, although they do not necessarily increase the bearing area.

LOCKING DEVICES

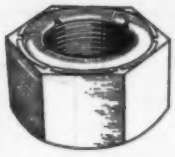
All bolts, nuts and screws have a tendency to work loose under vibration, particularly if strains of any kind are also present. Therefore, numerous devices with Class 2 or Class 3 fits have been developed to hold mating threaded parts together under vibration stress. These are known as lock nuts, locking bolts and locking threads.



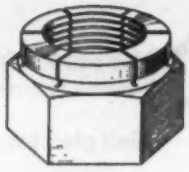
SECURITY
Elliptical alloy-steel retainer grips bolt threads



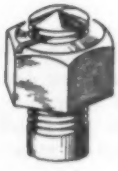
NATIONAL
Tightening develops a spring or flexing action to provide locking



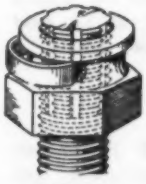
AN-COR-LOX
Soft metallic collar flattens against work, forcing edges into bolt thread



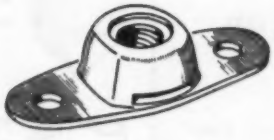
FLEXLOC
Segments press against bolt threads because inner diameter of upper part is slightly less than outside diameter of bolt



ANCO
Pin impinges against bolt to hold nut in place

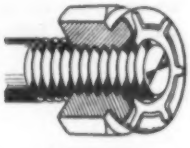


SIMLOK
Snap ring engages serrations in bolt thread to hold nut in place

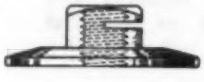


CAMLOC
Fiber collar grips bolt thread

COLUMBIA
Upper part of two-section assembly wedges into lower part when tightened



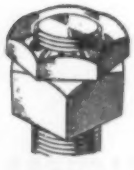
PINNACLE
Metal diaphragm provides spring locking action



SEALTITE
Threads in section above slot are deformed to provide friction grip

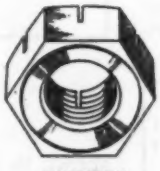
PALNUT TYPE 6 NAO
Top portion exerts spring pressure for added grip. No other nut is used with this type

SELF-RETAINING
Threads in section above slot are deformed to provide friction grip



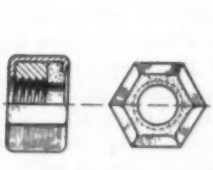
PALNUT
Single-thread lock nut applied and tightened after regular nut is in place

ESNA
Fiber collar grips bolt threads. Also available with metallic collar in place of fiber for high-temperature applications

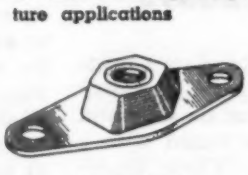


MARSDEN
Segments are forced inward against bolt threads when pressure is applied against recessed bearing surface

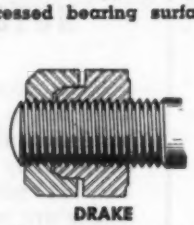
AEROTIGHT
Upper part of nut is slotted and turned in to provide spring grip



FIBER
Fiber collar grips bolt threads

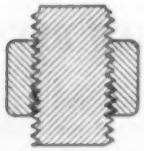


NUTT SHELL
Conventional nut pressed into light metal shell with fiber collar, which grips bolt threads

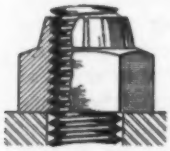


DRAKE
Consists of two separate mating parts

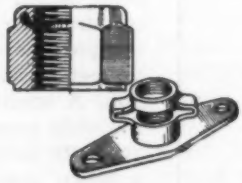
UNBRAKO
Fiber plugs pass through nut and press against threads of bolt



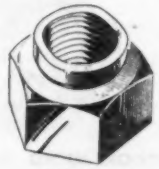
STOVER
Upper part of conventional nut is deformed to elliptical shape that provides spring grip against bolt threads



HUGLOCK
Upper threads press inward against bolt

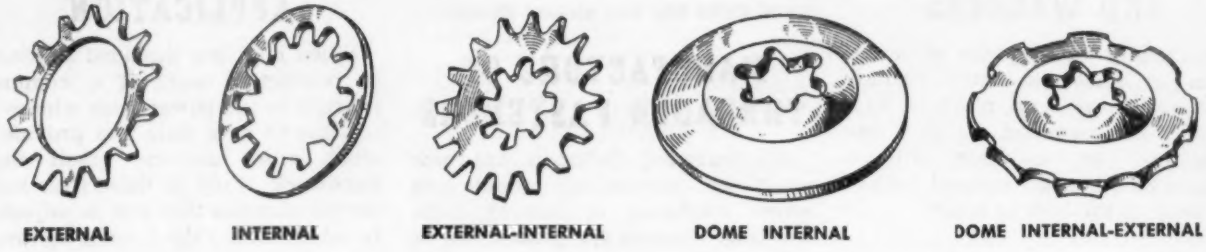


BOOTS
Threads of two sections are normally out of phase. Tightening sets up compressive force to provide holding



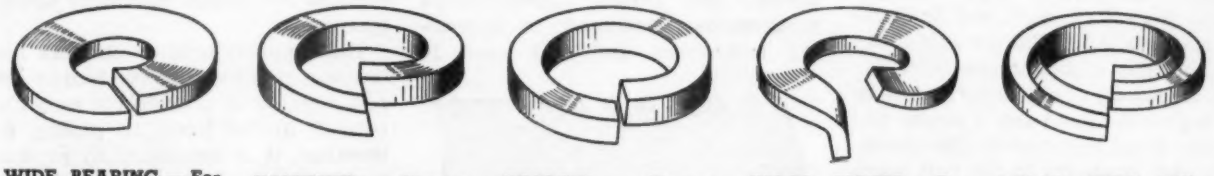
LAMSON
Raised crown is distorted and heat-treated to give spring grip on bolt thread

Examples of typical lock nuts



EXTERNAL | INTERNAL | EXTERNAL-INTERNAL | DOME INTERNAL | DOME INTERNAL-EXTERNAL

INTERNAL AND EXTERNAL TEETH—Teeth embed in face of work and bolt. External-tooth type is more generally used; internal-tooth type is used where smooth outer edge is desired and for other specific applications



WIDE BEARING — For use in place of flat washers but with added feature of automatic compensation for wear or developed looseness. Particularly suitable for use on materials subject to shrinkage, also for wide clearance holes. Tempered surface acts as thrust bearing

KANTLINK — Non-entangling spring lock washer suitable for applications similar to Knolink type. Angle-cut ends tend to embed more deeply and engage nut face and bolted surface

KNOLINK — Non-entangling spring lock washer suitable for general use and application on all types of automotive, farm implement, electrical, stove or industrial equipment

WOOD SPRING — For such as wood, rubber, plastics, fiber compositions or soft thin sheet metal. Anchor end embeds in surface and turned-up end engages nut, screw or bolt face

RIBBED TYPE "C"—Rib on inner periphery under compression wedges itself into the bolt thread and nut chamfer while introducing reactive pressure and tension in its assembly

HY-PRESSURE HY-CROME — Has superior strength and provides superior reactive values for each bolt size

POSITIVE TYPE "D"—Barbs on ends under compression embed themselves in face of nut, screw or bolt, and bolted surface, providing resistance to back turning

NONLINK POSITIVE—Non-entangling spring lock washer combining features of Kantlink and Positive types for use when these special features are needed

SPRINGLOX — Permits use of thinner, more resilient steel sections while providing reactive tension. Also, does not dig in or serrate bolted surface; for aeronautical purposes

ROUND EDGE HY-CROME — Special alloy-steel spring washer made to specification for each bolt size. Rounded edges avoid heat cracks. For high-quality products

Types of lockwasher

LOCK NUTS

The castellated and slotted nuts previously described are lock nuts in a sense because the purpose of the cotter pins is to keep the nuts from working off of the bolts. Still another locking device that is in general use, especially in aircraft, is the wired-lock arrangement. The bolts are drilled, the same as when castellated or slotted nuts are used, to permit a wire to be run through them.

Lock nuts are numerous and varied, as indicated in the accompanying sketches. Many of these are available in such forms as standard and thin hex, straight and circular gang channel, flange, anchor, floating anchor, self-anchoring, clinch, spline, top spanner and cap. On the whole, no special tools are required for the application of lock nuts. All of them can be handled with standard hand or torque wrenches. They usually can be started by hand until the locking section is reached, after which a wrench is necessary.

LOCK WASHERS

Washers are also made as locking devices for applications needing more resistance to vibration than is inherent in standard fastenings. They depend on resilience of the metal from which they are made in addition to sharp edges or teeth that tend to imbed themselves in the face of the work and the bearing surface of the nut, bolt or screw used.

CLINCH NUTS

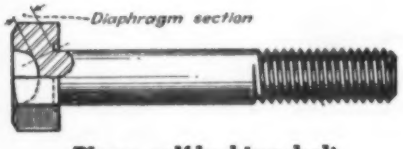
Clinch nuts are inserted in the work and clinched in place by swaging or peening. They then act as a nut plate for inserting bolts. When the nut is furnished with a self-locking fixture, no separate lockwasher is required.

PREASSEMBLED BOLTS AND WASHERS

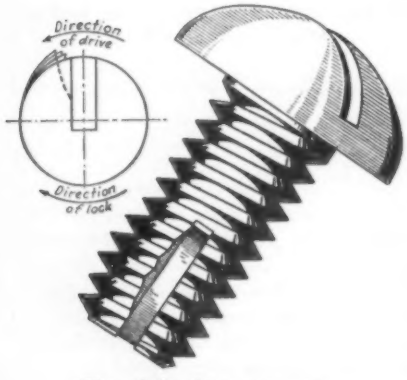
Practically all suppliers of varied types of fastening units include bolts or screws with plain or lock washers preassembled. At least one type, however, is made with a toothed flange as an integral part of the head of the bolt or screw.

OTHER LOCKING ARRANGEMENTS

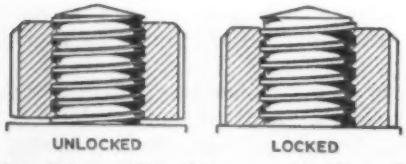
Other types of locking arrangements than lock nuts and washers are also available. Thus, a self-locking bolt has a diaphragm-head design consisting of a concave recess in the top of the head and a recess under the head adjacent to the shank. This adds elasticity to the bolt head, providing a spring-locking action. The shank-locking screw has a slot cut in the lower part of the threaded section and is then spread apart so that there is a "bulge" which produces a friction contact against the threads of the tapped hole. In the self-locking thread, a slope on the root of the bolt thread tapered 6 deg. with the axis of the screw thread opposes a like slope on the ridge of the nut thread. When unlocked, the nut turns freely, but when the nut meets the work the ridge of the nut thread is forced upward until the two slopes wedge.



Place self-locking bolt



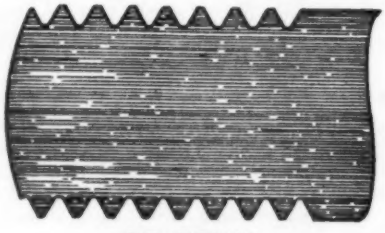
Shank-locking screw



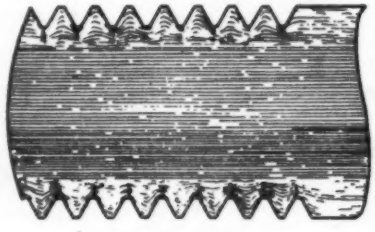
Dardelet self-locking screw thread

MANUFACTURE OF THREADED FASTENERS

All threaded fasteners are now made by machining, usually on screw machines, or hot or cold-working. Threads are ground, cut or rolled. Emphasis in recent years tends to indicate that rolled threads are stronger than cut threads because the material flows or is compressed into ridges. Lately, much progress has been made in improving techniques and dies used in thread-rolling so that precise results are common. Ground threads are relatively new, too, and closely controlled automatic production methods are responsible for a quality product that is steadily increasing in popularity.



CUT THREADS



ROLLED THREADS

Comparisons of cut and rolled threads

Heads of bolts and screws are now usually made by cold-forging. This takes advantage of the strengthening effect of cold-working on the material and has tended to cut the production cost of the bolts and screws. Nuts are made by punching, tapping and trimming. Threads of nuts are always tapped because they cannot be cold-rolled economically.

Heat-treated bolts, nuts and screws are stronger than those that are not so conditioned, although prestress is lost in rolled threads if they are heat-treated. To retain this prestress, rolled threads should not be heated sufficiently to relieve the stress, or the threads should be given a final rolling after heat-treating.

TOOLS FOR APPLICATION

When applying threaded fasteners in production work it is common practice to use power tools wherever feasible to save time and provide a much more uniform result than handwork. Many of these tools have torque clutches that can be adjusted to release when the desired tightness is reached.

These torque tools are available for driving all standard nuts and screws. In the case of the latter there are bits for slotted and some special recesses.

High-quality production work frequently requires precise torque setting because it is desirable to set up tension in the joint. In piping, for instance, it is necessary to produce tension in the bolts of flanged joints that will be greater than the pressure in the piping; otherwise the joint will leak.

Torque applied to a screw or nut is absorbed in three general ways: (1) frictional resistance on the bearing surface of the fastener which increases with increasing tension and which absorbs about 50 percent of the applied torque; (2) frictional resistance on the bearing faces of the screw threads which accounts for some 40 percent of the applied torque; and (3) the useful torque equivalent of the tension produced in the fastener through the screw-jack effect of the thread helix which accounts for possibly 10 percent or less of the applied effort. Therefore, most of the applied torque is absorbed by intermediate friction and the useful effects are relatively minor.

The relation between torque and total induced tension force can be expressed mathematically as

$$\frac{PL}{W} = u_B R_B + R_T \left[\frac{u_T \sec B + \frac{1}{2\pi NR_P}}{1 - \frac{u_T \sec B}{2\pi NR_P}} \right]$$

where P = force applied to wrench, lb.

L = effective length of wrench, in.

W = total induced tension force in bolt or screw shank, lb.

R_P = pitch radius of thread, in.

R_B = effective radius of action of functional forces on bearing face of bolt, nut or screw, in.

R_T = effective radius of action

of frictional forces on thread contact faces, in.

u_B = effective coefficient of friction bearing face

u_T = effective coefficient of friction on contacting surfaces of thread flanks

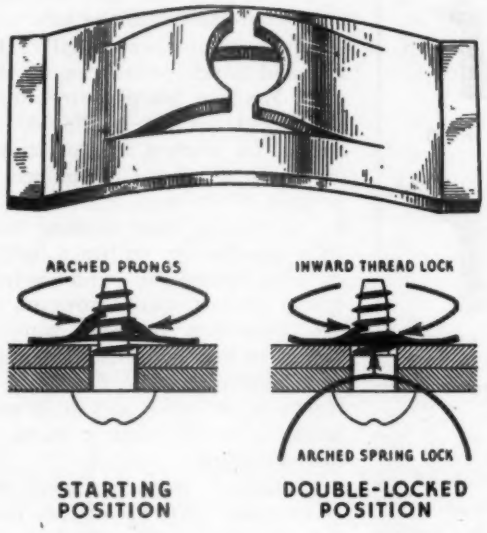
B = angle between mating faces of threads and a normal to the thread axis

N = number of threads per in.

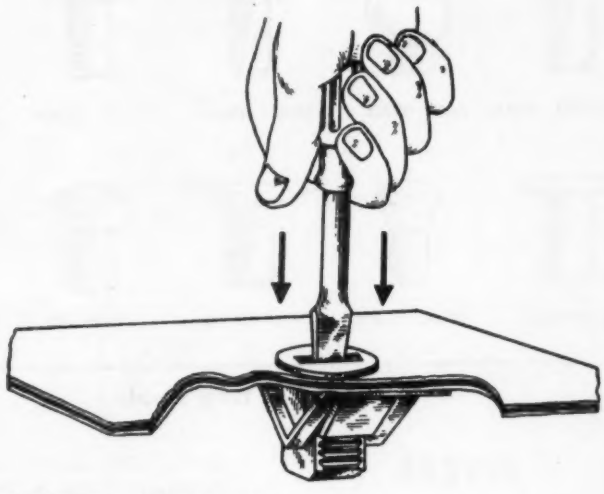
This equation gives a basic value to torque-tension ratio, but variations from this value may be considerable. Thus, the torque-tension ratio is by no means precise even though its importance as a factor in fastener assembly for many purposes cannot be over emphasized.

SPECIAL SPRING-TYPE FASTENERS

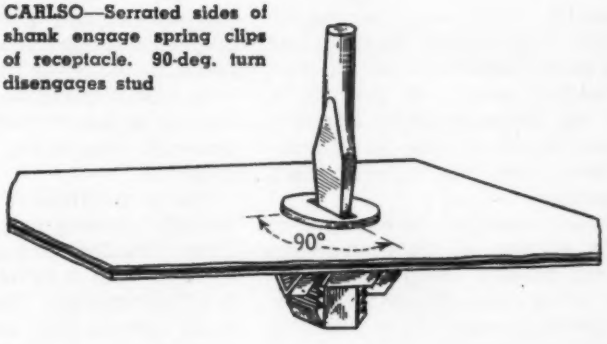
Various spring-type fasteners that incorporate special features are available for applications where such devices can perform satisfactory service. One of the principal features of these fasteners is the ease with which they can be applied. Technically they can be described as nuts made of spring-steel strip and having only one turn of thread. One type, however, can be obtained with multiple threads for high loads. In some cases, spring-type fasteners can be applied by merely pressing them on the stud or screw threads or on a notched stud. One type of special spring fastener is also available in a cage-type form in which legs are pressed together and inserted in a clearance hole. It is used for mounting aircraft instruments.

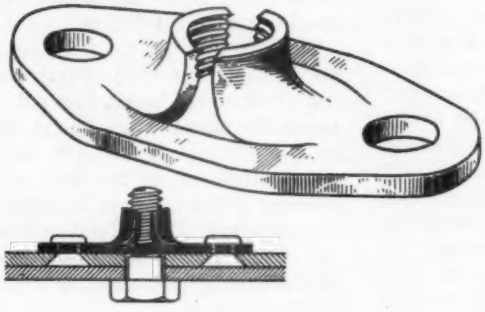


STANDARD FLAT-TYPE SPEED NUT—When tightened the prongs press against the stud and the strip acts as an arched spring lock

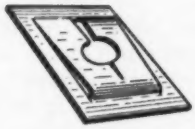


CARLSO—Serrated sides of shank engage spring clips of receptacle. 90-deg. turn disengages stud





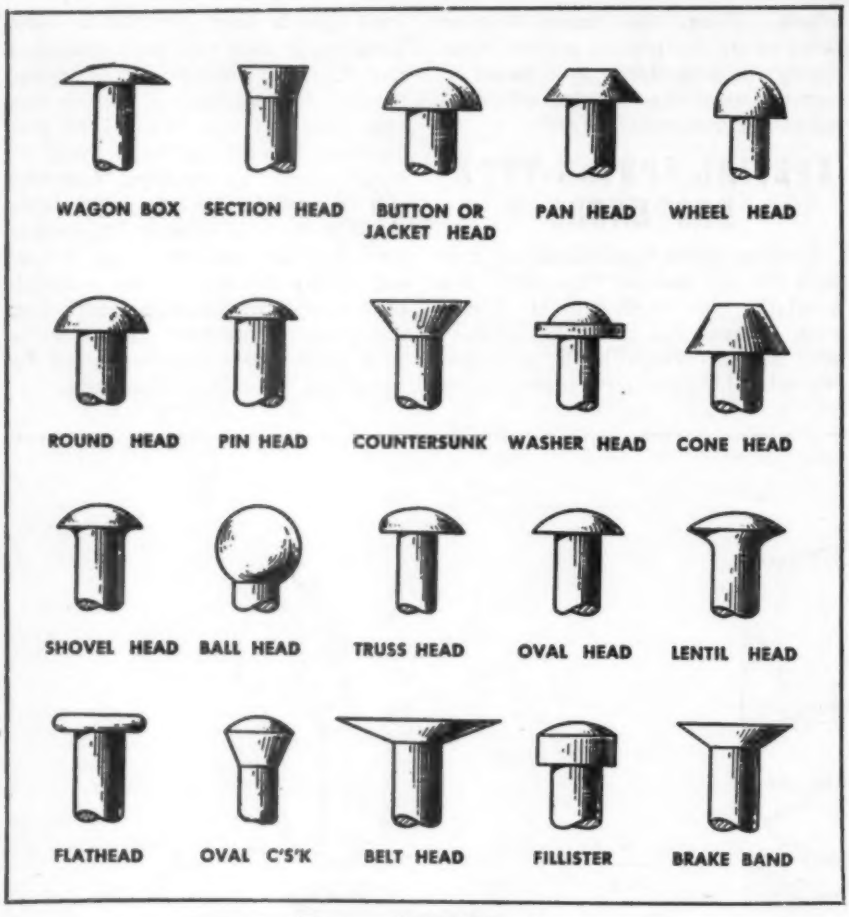
HI-STRESS SPEED NUT—Acts as a constant-torque fastener. Threaded prongs hold stud or bolt by friction and arched spring action



STALOCK—When screw or bolt is tightened spring action of fastener offers 360-deg. contact with single turn of thread

STALOCK PUSH-ON—Tongues bow the base when fastener is pushed on stud, providing locking contact

Typical spring-type fasteners



Types of rivet heads

RIVETS

Standard rivets are permanent fasteners. They depend on deformation of part of their structure to provide holding power. On the whole, rivets are stronger than standard threaded fasteners and, on a first-cost basis, they are usually more economical.

Standard rivets can be obtained in a wide variety of materials, sizes and head shapes. They are driven either hot or cold. Aluminum rivets, used mostly on aircraft, are usually cold-driven because cold-working improves the strength of aluminum. Most large rivets are hot-driven.

For heading standard rivets two tools are necessary—a hammer and a bucking bar. The latter is held against the head of the inserted rivet while the hammer heads the other end of the shank. The position in which these two devices are held determines the quality of the joint. Improperly headed rivets will fail quickly when the joint is placed under stress. Therefore, the shop man is the most important single factor in determining the quality of riveted joints.

Squeeze riveting has come into prominence lately as a method of heading rivets and has supplanted the hammer and bucking bar method. In heading by squeezing or compression the rivet is placed in the hole, held between the jaws of a tool and set by compression through mechanical, hydraulic or pneumatic pressure.

Where production runs are large enough, riveting machines are used. These usually exert pressure on the rivet to head it rather than heading it by hammering. The results are a more uniform joint because the force applied to each rivet is the same.

The number of rivets used in any joint depends on the type of sheets and rivets used. Joints made with two or five rivets can have equal strength if rivets made of the proper metal and temper are selected.

Shape of the driven head or point is chosen to meet definite service needs and to make driving as easy as possible. It need not be as uniform as the manufactured head and is formed on the work surface least seen.

Pressure used to "head up" rivets depends on the metal from which the rivets are made and subsequent heat-treatment. Sheet and rivet strength should match fairly closely to save labor and to prevent distortion of soft sheets by hard rivets.

Rivet holes should match closely in mated parts for proper expansion of the rivet. Jigs increase accuracy and speed production in drilling. Use of cutting fluids improves drilling quality. Double-fluted drills usually give the best performance if kept sharp. Burrs left by drilling are removed to give good fits on assembly and uniformity of riveting. Chips that lodge between surfaces to be riveted should be removed. Punched holes should be sized with tapered reamers.

Clearance of the rivet in its hole depends on the quality of job desired. In general, the smaller the clearance, the better the job.

Large rivets are usually driven hot and small rivets can be driven cold. Heating temperature must be controlled accurately. Heated rivets should be worked fast or they will cool before driving is finished. Aluminum rivets that are heated must be used soon after heating because they age-harden within a half-hour at room temperature and are hard to drive. Heat-treated aluminum rivets are quenched in cold water and stored in refrigerators. When stored at 32 deg. F., age-hardening in these rivets is arrested and they can be worked up to twelve hours after heat-treating.

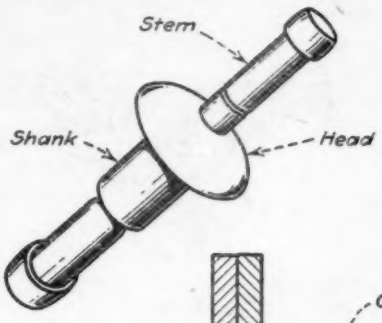
If driving stops too soon or the rivet point drifts to one side because the hammer is not held properly, heads will not be properly formed and unfilled holes will result. Deformed heads, and bucked and marred sheets result if driving lasts too long.

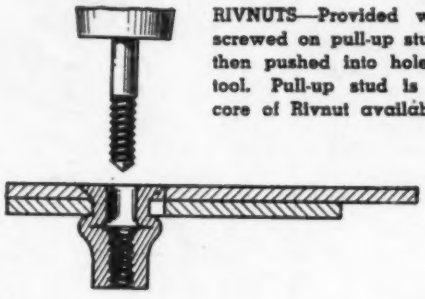
Inspection of rivets should be thorough. Things to look for are tightness of rivets, contact of heads with sheet, damage to sheet, distortion or cracking of rivet heads.

Defective rivets must be removed. To do this, first drill nearly through the rivet head, being careful not to touch the sheet. Then insert a punch in the drilled head and back the rivet shank out of the hole by hammering. If the sheet is damaged during removal of a defective rivet the job can be salvaged by reaming out the hole and driving a slightly larger rivet.

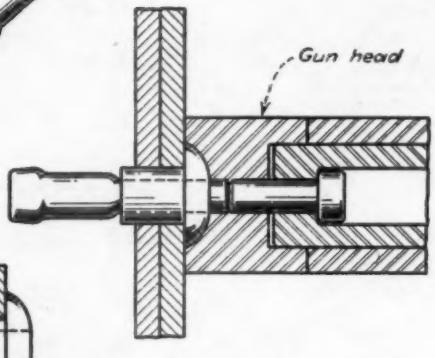
SPECIAL RIVETS

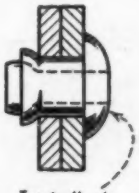
Various special rivets are usually intended for use especially in blind applications. Many of these are illustrated and explained in the accompanying sketches.





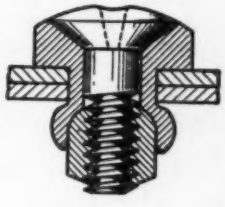
RIVNUTS—Provided with threaded core. First screwed on pull-up stud of special heading tool, then pushed into hole and upset by retracting tool. Pull-up stud is then unscrewed, leaving core of Rivnut available as nut plate

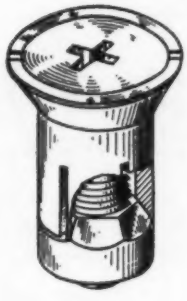




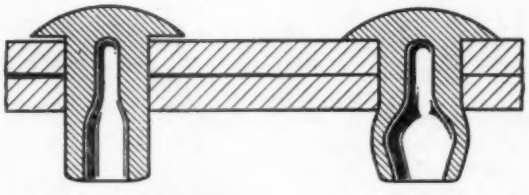
CHERRY — Available in self-plugging or tubular types. Installed by placing shank in hole and pulling stem with special tool to form tulip head on blind side

PRECO—Consists of steel bolt inserted in hollow stem of high-strength aluminum-alloy rivet and dural nut on end of bolt. Rivet is expanded when nut is drawn into it by turning bolt with a screwdriver



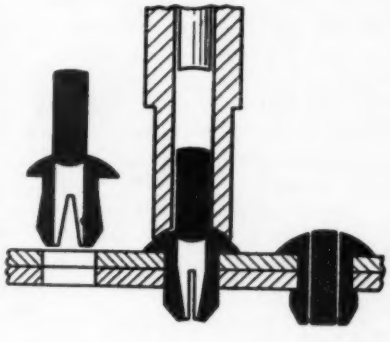


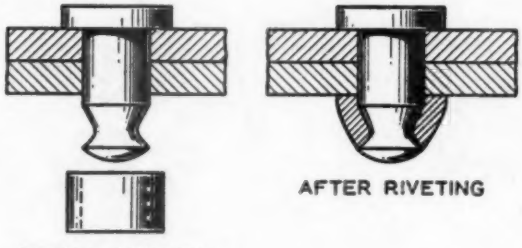
DAVIS — Consists of threaded shank inserted in sleeve and held together with nut with sloping faces. Standard Phillips screwdriver, with special sleeve to keep sleeve of fastener from turning, draws sloping faces of nut against far end of sleeve which expands slotted sections of sleeve against back of work



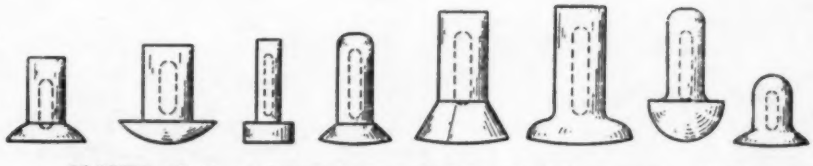
EXPLOSIVE—Charge in shank cavity is detonated with electric gun, expanding charged end of shank and forming head on blind side

DES-RIVET—One-piece plastic rivet consisting of head with plug attached by thin breakaway section and tapered shank split to form four tapered fingers. Impact from gun drives plug into shank flush with both ends of rivet, expanding tapered fingers against wall of drilled hole





HI-SHEAR — Aluminum-alloy collar is squeezed over alloy steel pin and trimmed with special tool



PLASTIC—Made of thermoplastic materials with hollow center, closed on end that expands into bubble shape when special gun is used. For non-stress applications such as fastening fabric to metal, wood or plastic sheets

Special rivets

QUICK-ACCESS FASTENERS

Quick-detachable or quick-access fasteners are widely used in aircraft for panels, cowlings, inspection doors, fairing and other types of panels where a strong fastener that can be quickly operated is desired. Also sometimes called spring-lock fasteners, these devices depend on the tension of a slotted or cross-pin stud on a wire or strip spring for their holding ability. Standard fasteners of this type have flush, oval or wing heads. In the first two, the head is slotted so that the stud can be easily turned with a screwdriver or other similar instrument—even a thin coin. These standard units are available in various sizes.

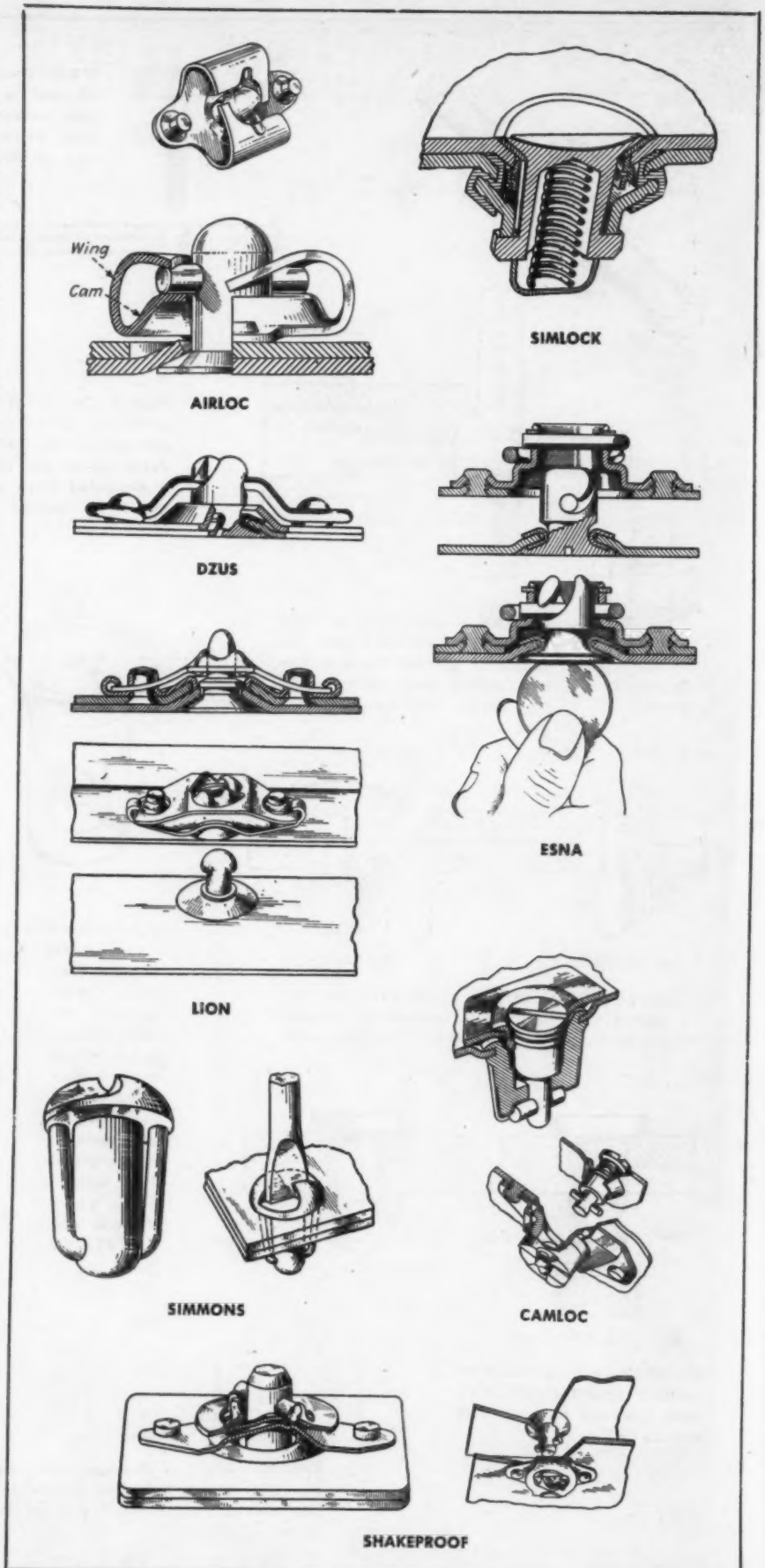
These fasteners are installed by drilling holes where they are to be located and riveting in place a receptacle for the stud. The stud can be either fastened in the sheet with a grommet, as it usually is, or can be loose until tightened. For use in plywood and other soft materials a pronged washer, pronged legs or similar device can be used to hold the stud and to provide a strong bearing area for the stud when the parts are locked together.

TEMPORARY FASTENERS

For locating and holding metal sheets together and to adjoining members prior to riveting there are devices known as sheet holders or clamps that are used as temporary fasteners. They have been widely used during the war by the aircraft industry in particular. Enough of these devices are inserted, usually with a special tool, to hold the sheets or assembly together, leaving many of the holes empty. Rivets are then

Temporary fastener

set in these empty holes and the temporary fasteners removed a few at a time and replaced with rivets. These temporary fasteners can be inserted and removed from one side of the assembly for the convenience of operators.



Quick detachable fasteners

Tool Data for Precision Boring—I

BY BRUNO HOLMSTROM, TOOL SUPERVISOR, THE HEALD MACHINE COMPANY

WHEN ESTABLISHING the details of set-ups for precision boring, the tool engineer must consider a number of factors. Two of these are: (1) with respect to back rake and end relief (bore clearance angle), what are the effects produced by setting the tool nose above the centerline of work rotation, and (2) the actual end-relief that must be ground on the toolbit so that the proper amount of side clearance is obtained when the tool is set at an angle in the quill.

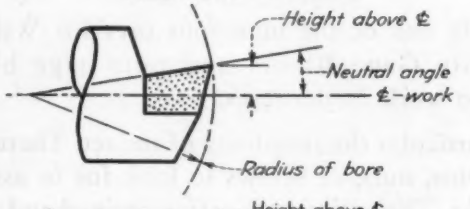
In connection with the first problem, our Tool Engineering Department has found convenient the two charts: "Neutral Angles" and "Bore Clearance Angles." Both of these charts are worked out to cover conditions when round-nose tools are set at various heights above the centerline of work rotation for bores of 5/16 to 6 in. in diameter.

The chart of neutral angles gives the actual back rake angle that must be ground on the tool in order to obtain an effective rake of zero degrees when the tool is set at a specified height above center in a hole of a given size. For example, to obtain a true rake of zero degrees when the tool is set 1/32 in. above center in a 1 in. bore, it will be necessary to grind a 3½ deg. back rake on the toolbit.

This chart of neutral angles can also be used to determine the amount of negative or positive rake that a tool will have at any position, in relation to the amount of rake ground on it. If in the example given, no rake were ground on the tool, the tool would in effect have a negative rake of 3½ deg. when set 1/32 in. above center in a 1 in. bore. Or if the tool were ground with a 10-deg. rake, the effective positive rake would be 6½ deg. Thus, true rake for any set-up can be found.

The end relief, or "bore clearance," angle *C* also varies with the distance above center, the diameter of the bore and the class of material. Two points should be borne in mind in connection with bore-clearance angles: (1) the angle *C* decreases as the tool is set at increasing distances above center, and (2) less bore clearance is needed when machining

NEUTRAL ANGLES

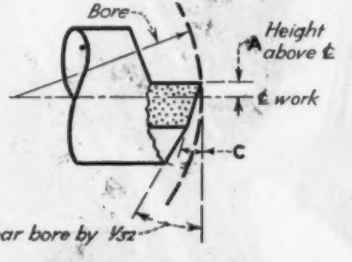


Sine "neutral angle" = Height above ℄ / Radius of bore

BORE CLEARANCE ANGLES

MATERIALS

GROUP I	GROUP II
Brass	Aluminum
Bronze	Copper
Cast Iron	Fiber
Cast Steel	Magnesium
Malleable Iron	Plastics
Semi-Steel	Rubber
Steel	Zinc Alloy



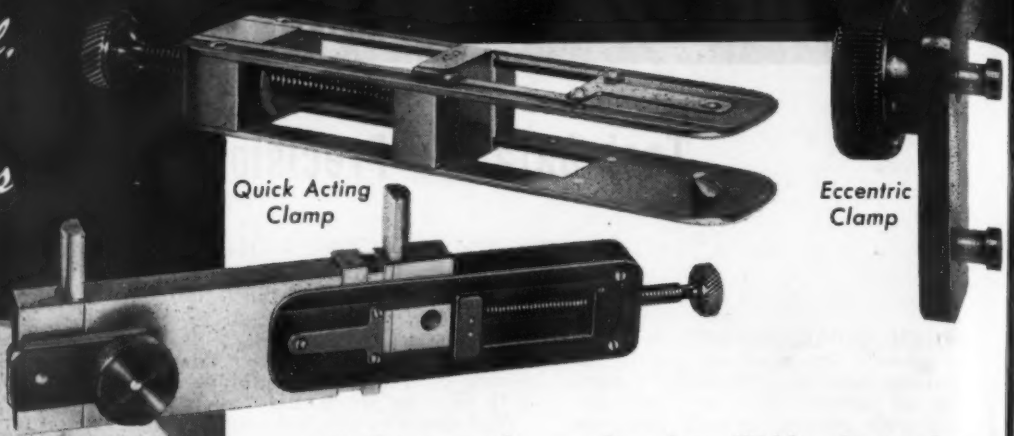
DIAMETER OF BORE	HEIGHT ABOVE CENTER LINE IN INCHES					
	0.010	1/64	1/32	1/16	3/32	1/8
	NEUTRAL ANGLE DEGREES					
5/16	4	6	11½			
3/8	3½	5	9½			
7/16	3	4	8			
½	2½	3½	7			
5/8	2	3	5½	11½		
¾	1½	2½	5	9½		
⅞	1	2	3½	7½	12½	
1	1	2	3½	7	11	
1¼		1½	3	6	8½	11
1½		1	2½	5	7	9½
1¾		1	2	4	6	8
2		1	2	3½	5½	7
2½		1	1½	3	4½	6
3			1	2½	3½	5
3½			1	2	3	4
4			1	2	3	3½
5			1	1½	2	3
6				1	2	2½

ABOVE ANGLES TO NEAREST ½ DEG.

DIAMETER OF BORE	FIRST BORE CLEARANCE ANGLE C IN DEGREES							
	When A=0		When A=0.010		When A=1/32		When A=1/16	
	MATERIAL		MATERIAL		MATERIAL		MATERIAL	
	Group I	Group II	Group I	Group II	Group I	Group II	Group I	Group II
5/16	10	13	9	12	3	5	—	—
3/8	10	13	9	12	4	6	—	—
7/16	10	13	9	12	5	7	—	—
½	10	13	9	12	6	8	—	—
5/8	10	13	9	12	6	9	2	4
¾	10	13	9	12	6	9	2	5
⅞	10	13	9	12	6	9	2	5
1	10	12	8	11	6	9	2	5
1¼	9	12	8	11	6	9	3	6
1½	9	12	7	10	6	9	3	6
1¾	8	11	7	10	6	9	4	7
2	8	11	7	10	6	9	4	7
2½	7	10	6	9	6	9	4	7
3	7	10	6	9	6	9	5	8
3½	7	10	6	9	6	9	5	8
4	6	8	6	9	6	9	5	8
5	6	8	6	9	6	9	5	8
6	6	8	5	8	6	9	5	8

WEBBER *heavy duty* GAGE BLOCKS

are practical, precision working tools



● For example, we show how Webber heavy duty gage blocks can be assembled easily and quickly into a positive accurate inside or outside caliper.

The inside flat surfaces of the jaws permit the quick checking of inside micrometers and pin gages or this setup can be used as a temporary snap gage. The ½" radius outside surface of the jaws permits the direct checking of all inside dimensions. A typical example is the ring gage illustrated which is being checked for size while still mounted in an internal grinder. There is no chance for error and you can work to limits in millionths of an inch.

This is only one of the numerous uses for Webber Heavy Duty Gage Blocks and puts gage block precision to work in the shop.

Note in particular the simplicity of the set. There are no loose pins, nuts, or screws to look for in assembling blocks. The entire set is self contained and provides measuring tools in a range from .300" to 24.000" or 36.000" and by the addition of extra 6.000" blocks up to 100 inches or more. In building up any measuring tool with these blocks—unique eccentric clamps are used to hold the blocks together. A quick acting clamp is used to firmly hold blocks of less than 1.000" in position.

It is only a matter of seconds to build up an accurate height gage—an inside or outside caliper or a divider.

Investigate the Webber Heavy Duty Gage Set for making precision measurements and for speeding up the operation of measuring.

Set No. H. D. 24
Range from .300" to 24.000" in steps of .0001" . . $385.00

Set No. H. D. 36
Range from .300" to 36.000" in steps of .0001" . . $450.00

Webber GAGE COMPANY

Tool Data for Precision Boring—II

Group I materials than is the case with Group II materials.

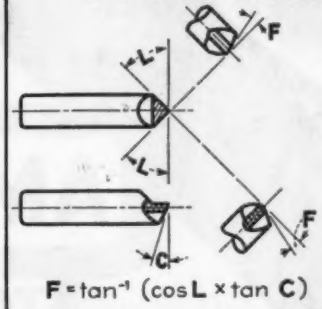
Proper clearance must be maintained. Too great an angle will cause rapid wear of the tool and chatter; too small an angle results in poor finish and added friction.

When toolbits with side angles L are ground with an end relief, or bore clearance, angle C, the side clearance angle is a function of these two angles, according to the equation, $F = \tan^{-1}(\cos L \times \tan C)$. On the Heald tool grinding and lapping machine, angle F is produced automatically by tilting the toolholder to angle C, and swinging the toolholder through an arc to angles L. We call F the "blending angle," and an accompanying chart lists blending angles for tools with various side angles L and bore-clearance angles C.

If the tool is set at an angle in the quill, the side clearance angle F becomes the bore clearance. Under these conditions it is essential to find the angle C to which the tool must be tilted during the lapping operation. Assume: (1) a tool with side angles L of 45 deg. and set at an angle with the bore axis, as in the illustration, and (2) the correct bore clearance angle for the job is 10 deg. The chart of blending angles can be used to find angle C, in this case the angle to tilt the tool during lapping, by the following steps. Under an L value of 45 deg., read down the column of F values until 10 deg. is reached. This will be the actual bore clearance. However, angle C is wanted. So move left on the chart to the column of C values, and read 14 deg., the angle to which the tool must be tilted during lapping.

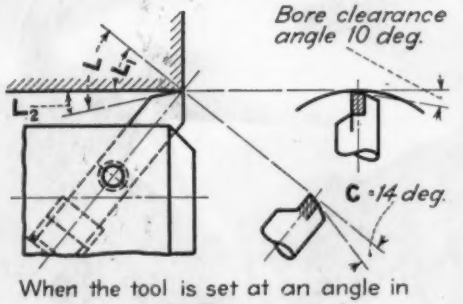
There is a slight error in the above method, because the bore clearance is actually for angle L_1. So the error introduced by using angle L in the above example equals angle L_2, but it is slight and may be overlooked. For example: if $L = 45$ deg., $L_1 = 40$ deg. and $L_2 = 5$ deg., read down under an L value of 40 deg. on the chart and across to the F value, where it will be seen that C is 13 deg. Since L_2 is usually between 2 and 5 deg., the error in angle C is ordinarily one degree, more or less, so that the use of the blending-angles chart, as outlined above, is usually satisfactory.

BLENDING ANGLES FOR PRECISION BORING TOOLS



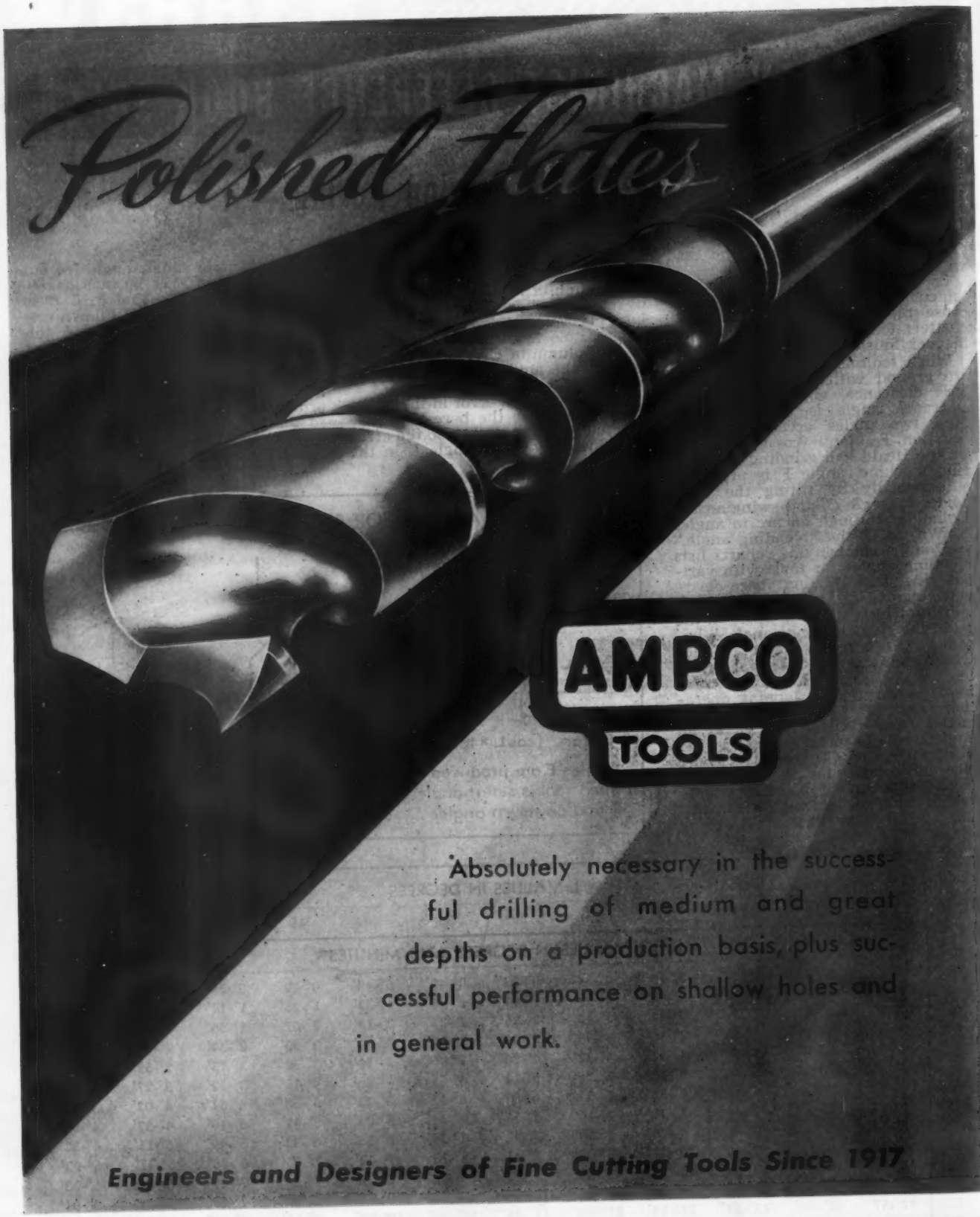
$F = \tan^{-1}(\cos L \times \tan C)$

Angles F are produced when tool is set at angle C and any given angles L



When the tool is set at an angle in the quill, angle F becomes the bore clearance

C	L VALUES IN DEGREES											
	5	10	15	20	25	30	35	40	45	50	55	60
	F VALUES IN DEGREES AND MINUTES											
1°	1°-00′	0°-59′	0°-58′	0°-56′	0°-54′	0°-52′	0°-49′	0°-46′	0°-42′	0°-39′	0°-34′	0°-30′
2°	2°-00′	1°-58′	1°-56′	1°-53′	1°-49′	1°-44′	1°-38′	1°-32′	1°-25′	1°-17′	1°-09′	1°-00′
3°	2°-59′	2°-57′	2°-54′	2°-49′	2°-43′	2°-36′	2°-27′	2°-18′	2°-07′	1°-56′	1°-43′	1°-30′
4°	3°-59′	3°-56′	3°-52′	3°-46′	3°-38′	3°-28′	3°-17′	3°-04′	2°-50′	2°-34′	2°-18′	2°-00′
5°	4°-59′	4°-55′	4°-50′	4°-42′	4°-32′	4°-20′	4°-06′	3°-50′	3°-32′	3°-13′	2°-52′	2°-30′
6°	5°-59′	5°-55′	5°-48′	5°-38′	5°-26′	5°-12′	4°-55′	4°-36′	4°-15′	3°-52′	3°-27′	3°-00′
7°	6°-58′	6°-54′	6°-46′	6°-35′	6°-21′	6°-04′	5°-45′	5°-22′	4°-58′	4°-31′	4°-02′	3°-31′
8°	7°-58′	7°-53′	7°-44′	7°-31′	7°-16′	6°-56′	6°-34′	6°-09′	5°-41′	5°-10′	4°-37′	4°-01′
9°	8°-58′	8°-52′	8°-42′	8°-28′	8°-10′	7°-49′	7°-24′	6°-55′	6°-23′	5°-49′	5°-11′	4°-32′
10°	9°-58′	9°-51′	9°-40′	9°-24′	9°-05′	8°-41′	8°-13′	7°-42′	7°-06′	6°-28′	5°-47′	5°-02′
11°	10°-58′	10°-50′	10°-38′	10-°21′	9°-59′	9°-33′	9°-03′	8°-28′	7°-50′	7°-07′	6°-22′	5°-33′
12°	11°-57′	11°-49′	11°-36′	11°-18′	10°-54′	10°-26′	9°-53′	9°-15′	8°-33′	7°-47′	6°-57′	6°-04′
13°	12°-57′	12°-49′	12°-34′	12°-14′	11°-49′	11°-18′	10°-43′	10°-02′	9°-16′	8°-26′	7°-33′	6°-35′
14°	13°-57′	13°-48′	13°-32′	13°-11′	12°-44′	12°-11′	11°-33′	10°-49′	10°-00′	9°-06′	8°-08′	7°-06′
15°	14°-57′	14°-47′	14°-31′	14°-08′	13°-39′	13°-04′	12°-23′	11°-36′	10°-44′	9°-46′	8°-44′	7°-38′
16°	15°-57′	15°-46′	15°-29′	15°-05′	14°-34′	13°-57′	13°-13′	12°-23′	11°-28′	10°-27′	9°-20′	8°-10′
17°	16°-56′	16°-45′	16°-27′	16°-02′	15°-29′	14°-50′	14°-04′	13°-11′	12°-12′	11°-07′	9°-57′	8°-41′
18°	17°-56′	17°-45′	17°-25′	16°-59′	16°-25′	15°-43′	14°-54′	13°-59′	12°-56′	11°-48′	10°-33′	9°-14′
19°	18°-56′	18°-44′	18°-24′	17°-56′	17°-20′	16°-36′	15°-45′	14°-47′	13°-41′	12°-29′	11°-10′	9°-46′
20°	19°-56′	19°-43′	19°-22′	18°-53′	18°-15′	17°-30′	16°-36′	15°-35′	14°-26′	13°-10′	11°-48′	10°-19′
21°	20°-56′	20°-42′	20°-21′	19°-50′	19°-11′	18°-23′	17°-27′	16°-23′	15°-11′	13°-52′	12°-25′	10°-52′
22°	21°-56′	21°-42′	21°-19′	20°-47′	20°-07′	19°-17′	18°-19′	17°-12′	15°-57′	14°-34′	13°-03′	11°-25′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Gaging Business

Auto Tool Chances Better

The Foreign Economic Administration's announcement that lend-lease shipments to the Soviet Union would be suspended since it is not at war with Japan improves the auto industry's prospects for getting the bulk of its reconversion tools as needed. The reason is that the FEA's action ties up about $75,000,000 in Russian tool orders, rated AA-1, and scheduled for shipment by the end of September, 1945. It had been earlier reported that Russian orders were blocking auto industry orders in at least nine out of 35 tool builders' plants.

With the Russian orders out of the way for the present, the auto and other industries requiring reconversion tools will only be competing with some $135,000,000 in high-rated military orders on the books of the tool industry. This total, and some $90,000,000 in reconversion tool orders (of which $40,000,000 is for the auto industry), will represent about five months' shipments at the tool industry's recent rate of $39,000,000 per month. It is likely that additional military orders will be cancelled over the next few months, thereby tending to ease the prospect for reconversion tools that much further.

However, if shipment of Russian lend-lease tools is shortly resumed, then reconverting industries will need a AA-1 priority, if they are to get tool deliveries when needed. Meanwhile, tool builders are doing their best to manipulate their orders in a manner calculated to keep everyone satisfied.

One thing is sure. The automobile industry will be lucky to get the presses it needs within five months, since these machines are rated among the most critical equipment items today. Moreover, there is no chance of getting such items out of surpluses, since the auto industry's needs are for special types of presses.

Materials and Manpower

In their attempt to deliver to the auto industry some 5,000 new reconversion tools worth about $40,000,000, tool builders have been assured by the War Production Board that they will be aided to secure any bottleneck materials or components. Such aid will be particularly effective in securing bearings, motors, and similar items, which continue critical despite VE-Day cut-backs. In such cases, WPB will assign AA-1 ratings for the required components. The easing of materials and the pending WPB relaxation of controls assures the industry of having little or no problems in that respect.

However, the industry's labor situation will militate against increased shipments for the present. Employment in March dropped to 56,000 from 56,900 in February, and 72,500 for February, 1944. Since many tool builders are facing further inroads of the draft into their skilled labor supply, they are actively seeking thousands of new employees.

Controls Status

For industry in general, the superficially rosy reconversion outlook still contains many curbs and handicaps. Thus, while the relaxation of WPB curbs against non-rated orders for steel, copper, and aluminum slated for July 1, 1945 seems to clear the way for reconversion, the fact is that existing manpower controls, continued draft calls, wages and hour questions and OPA pricing restrictions on consumer goods loom as formidable obstacles to resumed peacetime production. Manufacturers who produce less than $50,000 worth of goods quarterly may find some value in the AA-4 priority which will be granted to them beginning July 1, 1945.

This means that industry may be unable to utilize for peacetime production the 2,000,000 tons of steel, the 250,000 tons of copper and brass, and the 150,000,000 of aluminum, which War Mobilization Director Vinson predicted would be released during the first quarter after VE-Day.

Most manpower shortages should be wiped out within the next six months, in view of Vinson's estimate that some 1,500,000 munitions workers will probably lose their jobs over the next six months. This development, combined with the planned demobilization of some 2,000,000 men from the Army over the next year should more than fill in manpower gaps.

Jap War Job

The job of licking Japan is expected to require the continued efforts of 7,500,000 of the nation's present 9,000,000 munitions workers over the next six months, and at least 4,500,000 of them over the following six months. This force will be needed to turn out increased military requirements for steel barges, landing vehicles, Browning machine-guns, motorized shop equipment, and large-calibre artillery, and the continued, but reduced needs for heavy artillery and artillery ammunition, trucks, light tanks, tank destroyers, and Garand rifles.

The Navy will spend $4,225,000,000 for its second quarter procurement and production program, $4,095,000,000 for the third quarter, and $3,759,000,000 for the fourth quarter. Its 1945 expenditures of $16,266,400,000 will compare with 1944's total of $18,912,000,000.

Navy Tools Will Still Be Busy—Victory in Europe does not mean much to the thousands of Navy-owned machine tools, which will be kept busy until Japan surrenders. Navy equipment includes such items as these giant boring mills in the Drydocks Machine Shop, Terminal Island, California, used primarily to face condenser plates and bore propeller hubs

72 Industries Get Reconversion Aid: Priorities for Tools, Construction

WASHINGTON — AA-3 priorities being granted by the War Production Board on machine tools and construction for reconversion of 72 industries, puts all of them on an equal footing. Ratings are being granted only for those items the lack of which would hamper reconversion. All equipment and construction on hand that can possibly be pressed into service will not be replaced. WPB is not yet figuring on all-out re-tooling and re-construction.

The list of 72 industries is merely a worksheet. Not all of the 72 will need help. Others not yet listed will be added. The list to be longer or shorter than it is now at various times.

$102,000,000 Rating Aid

Top dollar limit on amount of ratings is set at $102,000,000. Of this total the automobile industry has been allocated $85,000,000, WPB explained, since the industry has been heavily converted, and because its equipment is costly.

At present, applications for construction under $100,000 and for retooling under $25,000 will be handled by WPB field officers. As most applications will be small, field officers will handle the bulk of conversion priority.

The balance of $17,000,000, allocated to 71 industries other than automobiles is more ample than it looks, when one considers that most applicants will need only a few thousand dollars worth each. WPB said that the 72 industries had been picked from those listed in the monthly WPB publication, "Products and Priorities."

Refrigerator Situation

In further explanation of the selection made, WPB pointed to the refrigerator industry as an example. The industry has been almost 100 per cent converted to war production and has been out of production as far as refrigerators were concerned. Reconversion for that industry involves plant layouts, the use of different materials, the use of different skills, etc. In varying degrees this is true of each of the industries named, WPB said.

Reconversion administrators have been named for all industries, whether they are on the list yet or not. These administrators will work with the various WPB industry divisions concerned with their particular problems, with the industry advisory committees, and with representatives of individual establishments. Detailed studies have been made, and are being expanded, of each industry's particular reconversion problems and postwar opportunities.

In granting an AA-3 rating now as announced April 17, for reconversion retooling and construction, WPB said, the agency hopes to reduce the time lag between the cancellation of war contracts and the start of actual peacetime production.

The break-even needs of the automotive industry have been estimated as $50,000,000 for tools and accessories and $35,000,000 for construction. Next in dollar value on the list is the mechanical refrigerator industry with an estimated immediate need of $6,000,000 for construction and $5,000,000 for tools. Other estimates are the domestic cooking and heating industry, $1,675,000 for construction and $2,500,000 for tools; the laundry industry, $1,500,000 for construction and $490,000 for tools and the cast iron and sanitary equipment industry, $1,000,000 for construction and $500,000 for tools.

VE-Day Leaves Many Labor Policies Confused; Controls Will Continue

NEW YORK—Imminence of the end of the war in Europe had been recognized by government, industry, and labor for weeks before VE-Day, since cancellation of orders, cut-backs, and layoffs were ample indication that the European phase of the nation's two-front war was actually over. Yet, the announcement of VE-Day found planning meager and confused.

Essentially, most present controls will be continued. There will be no abandoning of the "Little Steel" wage stabilization formula, no lifting of manpower ceilings and other control regulations in critical areas, no general reduction of the work-week to 40 hours or less. But many workers may look for wage increases to eliminate substandards, and some formula may be worked out to permit relief for workers who suffer wage reductions through shortening of the work-week. Significantly, the National War Labor Board will exercise its authority to prevent any general downward trend in wages. Just how this will be done is still unanswered.

CIO Wants Controls

The labor position, as outlined to Vinson by C.I.O., is that the government should continue production programming, including allocation of materials, to the extent necessary to sustain civilian economy for war production purposes and to generate economic activities that will create full employment. C.I.O. would like to see war controls extended to non-war activities, such as housing, consumer durable goods, transportation, food, and clothing.

General Indications are that:

Manpower will continue under controls through VJ-Day. Areas will be reclassified as production urgencies change, and as gradual demobilization routes servicemen into plant jobs. Spot authorizations will help spread employment on civilian production. The so-called "labor freeze" will continue to be relaxed —it will be lifted July 1 in Class III and Class IV labor areas.

Wage Prospects

Wage and salary controls will continue. Emphasis will be placed on putting a floor under wages, as well as a ceiling over them. NWLB will permit no wage reductions unless they are justifiable under the changed conditions of peacetime production.

The work-week will come down to 40 hours in many reconversion industries, but those in war production can be expected to maintain at least a 48-hour week until Japan collapses—even though it means layoffs of the undercrust of newly-hired workers. Idea is to hold up wages as long as possible, to make war jobs attractive.

Labor's Aims

Strong influence will be brought to bear by labor for a quick end to the "Little Steel" formula, general wage adjustments upward and improvements in working conditions, a shortened work-week but no reduction in take-home pay, adequate unemployment compensation, and permanent legislation to wipe out employment discriminations.

VE-Day brings greater administrative strains for the 26 labor boards, commissions, committees, and agencies which the federal government has charged with administering the duties originally entrusted to the Dept. of Labor.

More Strikes Ahead

Moreover, with the halving of the nation's war job, less reliance can be placed on patriotism as a labor influence. Workers, already restive, will not react only on major questions. Already they have struck—in violation of no-strike pledges—over such minor issues as where a machine should be placed in a workroom.

Detroit Letter

Red Tape vs. Reconversion

Red tape, caused by too literal interpretations of the War Production Board rules, is holding back the reconversion of the automobile plants and their suppliers and sub-contractors. Despite the energetic steps taken by Henry Nelson, designated by WPB Chief J. A. Krug to coordinate reconversion in the industry, progress is being slowed by regulations, still on the books, which have now become useless.

Nelson, it was learned, has dashed back to Washington several times to untie the red tape and cut through it. But when he returns here, he finds other regulations have been invoked to block progress. In short, Nelson finds he has many responsibilities but not enough authority.

Suppliers Not Aided

One of the big complaints the car builders have is that while they have been given some help by WPB, their suppliers and sub-contractors have been overlooked.

For instance, one parts maker has a post-war program that involves from $8,000,000 to $10,000,000 in new machine tools. He needs at least $1,000,000 to start reconverting. So far, he has been given no assurance of getting that small proportion of machine tools.

The industry itself calls the AA-3 rating assigned to its needs only a "hunting license." The help that Krug promised it on his visit here will have to be invoked to get in shape for new cars. Only about 50 per cent of its needs will be met in the next six months without that extra aid, officials state. The reason for this apparent trouble in getting the vital machine tools seems to be the slowness with which cutbacks filter through to the machine tool builders. Cutbacks in the munitions program, made more than a month ago, are just becoming felt by tool manufacturers.

O. K. Reconversion Plans

Nevertheless, progress is being made in preparing for reconversion. Almost all of the $125,000,000 in new machine tools, jigs, dies and fixtures, construction, etc. have been processed through by the WPB. All of it, of course, is subject to revision, and the regional office is checking all figures to make certain they are only for essential needs of each company and not to give it an edge over some rival company in the post-war race for supremacy.

Another thing WPB is keeping an eye on is the matter of inventories. It was learned that some companies were holding back on reporting inventories on hand, to give them the break on materials when it came to building cars.

The compliance section of WPB, however, let the manufacturers know that it is ready to pounce down on any hoarding of inventories. The Detroit compliance division has been one of the most active in the country and the manufacturers have come to know that it works fast and cracks down hard.

1946 For New Cars

Guessing on the probable date when new cars will appear still is the popular sport here. Even the Automotive Council for War Production recently ventured forth with the prediction that there will be a few cars in the latter part of 1945 but that any appreciable production is not looked for until the first quarter of 1946.

The feeling is that some pilot models may come off the assembly lines before the first of the year but they will be few in number. Ray Chamberlain, secretary of the National Auto Dealers Association, is willing to bet that not more than 2,500 post-war cars are licensed in 1945.

Ford is still given the edge in getting off to a flying start. With its vast resources, big tooling facilities and big cutbacks this company could beat all others by as much as two months. Its jeep and truck assembly lines could readily push out a substantial number of passenger cars in record time.

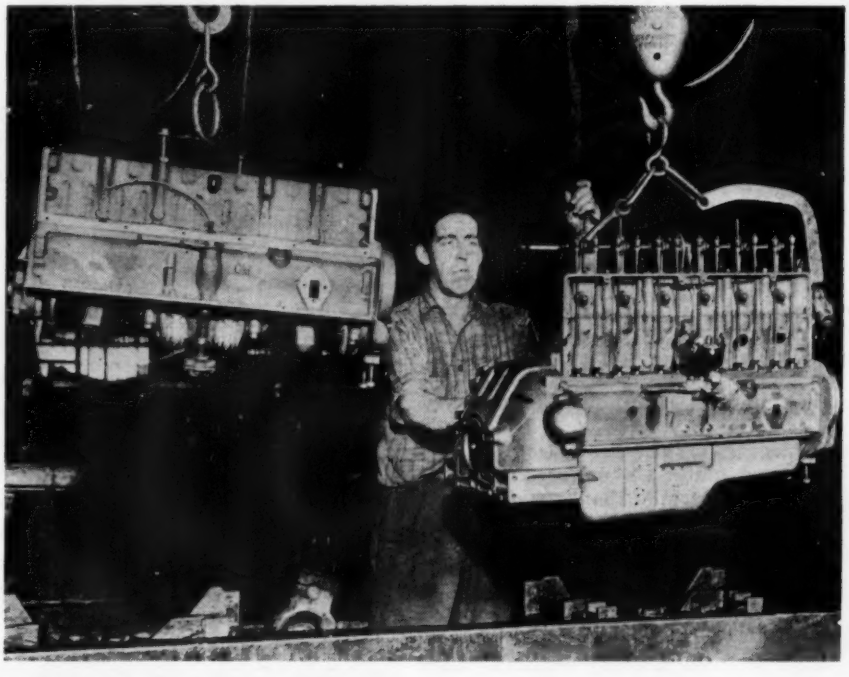
Other manufacturers are said to be a trifle jealous of Ford's cutbacks. The Willow Run and Pratt & Whitney engine cancellations seem hardly to be envied, but from the competitive standpoint, they are.

Many Other Problems

With more and larger cutbacks in the offing, the problem of re-employment is becoming acute. Unemployment compensation claims are zooming and fear is being expressed that large-scale layoffs, coming together and prolonged, could easily break the fund that is dwindling under present inroads.

The acute job situation may bring about the steps necessary to cut down the delay in reconversion. One of the most important of these moves is the freeing up of the company-owned tools now being used on war work, and the substitution of government-owned tools for company tools in the production lines.

When the industry is not worrying about production problems, it is studying the problem of pricing of the cars which will roll off its assembly lines.



Reconversion Forerunner—Until new cars and trucks are again coming off the production lines, short blocks (shown at left) being volume produced by Chevrolet side-by-side with engines for army trucks and other military vehicles will help keep badly worn civilian autos and trucks in operation. Providing the virtual equivalent of a new engine, short blocks are being produced in greater volume than peacetime levels

Post-VE Day Plan Permits Partial Change-over to Peacetime Economy

WASHINGTON—Cut-backs in military orders, while not yet fully resolved, indicate that substantial leeway will be permitted manufacturers in reconverting to civilian products. The Jap war will come first, but the cessation of demand from the European theater and the transportaiton of supplies and equipment from Europe to Asia will leave materials and plant capacity available for non-military purposes. The War Production Board is endeavoring to formulate its policies to expedite this transition and thus reduce to a minimum any unemployment that may occur during the period of adjustment.

Largest cutbacks will be in ships, tanks, artillery and artillery ammunition to the 105-mm. size. Aircraft production will narrow down to the big superbombers and selected types of new pursuit ships. However, the truck schedule will be maintained at a high level. Offsetting in part reductions in new army schedules will be an increase in replacement parts orders. At the start of the year these were estimated at $1,000,000,000 for 1945. Current production at $50,000,000 monthly is below the demand for replacement parts.

Unrated Tool Output

For some months the War Production Board has permitted the making of machine tools to fill unrated orders. Shipments made under this permission have been small because of shortages in manpower and material above war requirements. More recently WPB initiated a policy of granting ratings to items the lack of which would hamper reconversion in 72 listed industries, not to full production, but to a "break-even" basis.

Materials, Manpower Limits

Progress will be limited by the release of materials under the Controlled Materials Plan and by the manpower available. The policy on materials is to relax or remove controls as cut-backs relieve tightness in specific classifications. The relaxation will take several months and will be made gradually subject always to fresh military demands that may require tight controls. Machine tools will continue to be scheduled for some time.

It is estimate that cut-backs will make about 2,700,000 tons of steel available quarterly and to this may be added the reduction in inventories of small subcontractors in an amount difficult to appraise. All kinds of steel will not be equally affected, and for two or three months both sheet and strip are expected to continue tight despite the reconversion of continuous mills to these products. Foundry products will still be affected by a shortage of manpower, especially malleable and gray iron castings.

Brass Strip Cut

Lessened demands for ammunition for a one-front war will cut brass strip needs to 288,000,000 lb. monthly as against 412,000,000 lb. for a two-front war. This last demand has never been met, March production of strip being 334,250,000 lb. Supplies visible for non-military products will thus total only a little over 40,000,000 lb. monthly as compared to normal peacetime needs of 130,000,000 lb.

The aluminum situation has eased considerably since drastic reductions in the B-17 and B-24 bomber progress and the curtailing of P-38 fighter plane production; but aluminum sheet is not yet plentiful because of manpower shortages.

Other metals in tight supply are tin, cadmium and lead.

The manpower question is confused by the difficulty of getting workers to shift to needed products.

200,000,000 Man-hours Saved By War Workers Suggestions

WASHINGTON — Over 200,000,000 man-hours of work per year are being saved as a result of production suggestions received through the national program conducted for the past three years by the War Production Drive Division of WPB, according to J. A. Krug, WPB Chairman. Mr. Krug's statement was made on the occasion of welcoming Capt. James O. Gawne, U. S. Navy (retired), as a member of the War Production Drive's Board for Individual Awards. Although the other 11 members of the Board are engineers and technicians from private industry, Mr. Krug invited the Navy Department to assign a naval officer to the board in recognition of the Navy's contribution to the national suggestions program.

Since the beginning of the war, the Board has considered over 10,000 suggestions—the cream of an estimated 6,000,000 submitted during that period by workers to joint production committees at some 5,000 plants and industrial installations.

Navy Officer Joins Individual Awards Board—WPB Chairman J. A. Krug (fourth from left) welcomes Capt. James O. Gawne, USN (retired), as a member of the War Production Drive's Board for Individual Awards. Other members of the Board shown in photo (from left to right) are: Maurice Nicholls, consulting engineer, Kaiser Co.; Howard Miner, consulting engineer, Mansfield, Ohio; John Haydock, executive editor, "American Machinist"; Krug; Capt. Gawne; John B. Scheel, awards branch chief; W. F. Todd, acting director, War Production Drive Division, WPB; (in rear) Paul H. Stanley, chief engineer, Pitcairn Autogiro Co.; (in front) James B. Gent representing United Steelworkers of America, CIO; Charles B. Francis, chemical engineer, Carnegie-Illinois Steel Corp.; William B. Hill, assistant superintendent, Bethlehem Steel Corp.

Washington Bulletin

Demobilizing Aviation

How best to demobilize the aircraft industry—a "precision metalworking industry"—is one of several major problems facing the nation. Airplane production climbed from 44th position in peacetime industry to a volume of $12 billion in 1943 and $16 billion in 1944. In 1936-37, average production was about 3000 units; by 1942 output had reached 3000 per month, and two years later, taking increasing unit weight in its stride, the industry was delivering 8000 airplanes per month, once touching 9000, and was by far the biggest enterprise of all times.

Survival of the industry, opportunity for employment, the prosperity of large communities, and more important, the future military security of the country, depend in large measure upon sound planning for deactivating this enormous source of air power, for war and peace.

Special Committee Formed

Congress, recognizing the urgent need for a plan, has taken the lead in creating one. The War Contract Subcommittee of the House Military Affairs Committee, and the Industrial Reorganization Subcommittee of the Special Senate Committee on Post-War Economic Policy and Planning, are asking for a report on which to base legislation. To make the needed report, the informal Interdepartmental Committee on Demobilization of the Aircraft Industry has been formed. This committee consists of the Assistant Secretaries for Air of War, Navy, and Commerce Departments: Robert A. Lovett, Artemus L. Gates, and W. A. M. Burden.

A preliminary report has just been sent to Congress by the Committee.

The current report, titled Preparation of Joint Hearings, on the Disposal of Surplus Aircraft Plants and Facilities, lays down basic largely non-controversial principles, and poses questions.

Study's Scope Broad

Studies initiated by the Committee are sub-headed as follows: (1) estimate peacetime military aircraft replacements, and research facilities for military and civil aviation; (2) translate those estimates into peacetime aircraft production needs; (3) study aircraft production expansion for this war and determine what rate of expansion can be expected in future emergency; (4) appraise the value of facilities that could be kept in standby, and extent to which they would supplement the operating and converted industry in emergency; (5) estimate the numbers and types of military airplanes needed in future emergency, and alternate plans for producing them.

Conference Leaders Greet VE-Day—The end of the war in Europe on May 8th struck a happy note at the United Nations Security Conference meeting in San Francisco. Shown here, left to right, are Foreign Commissar V. M. Molotov, of Russia, U. S. Secretary of State Stettinius, and Foreign Secretary Anthony Eden of Great Britain

New Federal Loan Administrator

John W. Snyder

War and Navy Departments want three main contributions from the peacetime industry: ability to provide aircraft replacements of superior design and performance; ability to carry on its important share in research to maintain U. S. Leadership; ability to expand rapidly for any emergency.

One great difficulty is that airplanes may not continue to perform their present role in war. Presumably the Committee here refers to potentialities of powered and guided missiles, such as the German V-1 and V-2 bombs.

Plant must be planned on the assumption that manufacture will "not be impaired by surplus aircraft disposal policies which either force the services to use obsolete equipment or seriously interfere with the normal market for non-military planes."

Standby Equipment

Considering the practicability of standby plant (either idle or in convertible civilian production) the Committee observes that empty buildings would be of some value, particularly if equipped with general purpose machine tools, which would avoid overloading the machine tool industry with orders for all types of production equipment. Citing the probable shift to jet engines as an example, the Committee says tools designed specially for the production of reciprocating engines might become obsolescent or useless.

It is assumed the aircraft industry will tend to return to its home plants and that within 5 years 80% of airframe floorspace, 90% of engine space, and all of propeller capacity will again be within 200 miles of Atlantic, Pacific and Gulf coasts. Dispersion of this "precision metalworking industry" during the war period is surprising.

Spotting the Air News

Demobilizing Industry

As aviation production is the biggest of all industries its reduction to ten percent or less of its war-time high will be the greatest industrial demobilization and conversion in history. To the automobile producers and others who converted to aircraft and components the shift is merely a technical and organizational problem: they go back to production for their own hungry markets.

But two other groups in aviation face problems of re-establishment, even of survival. One of these is the little men, and some not so little, who jumped from nowhere in particular into the war breach, to make nuts, struts and widgets for aircraft.

New Business Propects

The Old Line Companies, as they like to call themselves, are expanded out of all proportion to the prospective market, and it is they who are facing a fight for "survival," to use their own term. What they mean by that is that they want to keep as big a slice of their present business as they can.

Their first problem, then, is to look out for orders. Their best prospect for a big "survival" order is the United States Army and Navy. Chief salesman on that job right now is E. E. Wilson, vice chairman of United Aircraft and President of the Aeronautical Chamber of Commerce,who has written a convincing book: *Air Power for Peace*. Mr. Wilson contends that the aviation trinity: air force, air transport, and air industry, will generate nearly enough profit to pay the cost of air power, and the balance of cost will be well invested in protection against wars. Orders from air transport will be relatively small; the air lines have indicated they will want only 300 airplanes during this year and 1946. There will be some export, in competiton with England. Surplus military air transport planes, being obsolescent and expensive to convert, will not long drug the domestic transport market, but because of low price, many foreign countries will buy them in preference to new ships. So far private flying looks like small potatoes; a half million units in several years is the estimate.

Reconversion Doubts

Other problems in the minds of most aircraft producers today: Get a contract termination settlement and set up a peace-time financial structure—the cash reserve of most airplane makers is very short. Get government-owned machinery out of privately owned plants, and/or dispose of owned plants and make best possible deals for RFC plants. Decide what type of product to manufacture: military, transport, or personal airplanes. Some of the big companies, whose names have taken on valuable public recognition, like Boeing, Consolidated, North American, Martin, and others will be deciding whether to go into non-air products. Boeing is definitely interested; Consolidated has an order for buses; Beech has already gone into prefabricated houses.

Navy Orders Firm

Many of the manufacturers, especially those building and contributing to the Boeing B-29, the Lockheed jet-powered Shooting Star fighter, and most airplanes used by the Navy, will continue under pressure for full-scale deliveries for the war on Japan. But the War Production Board already has planned a tapered cut-back from the 7000-per-month level to 5000 during the rest of this year. When the air forces of America and England get their European aircraft into the Orient and add up their power, they may call for drastic stop orders. The Japs could make the most decisive move by reading the writing on the wall and surrendering. Big chunks of the industry will be shut down soon. The bulk of it *could* be shut down soon.

The Aeronautical Chamber of Commerce would like for Congress to fix the size of U. S. peacetime air forces at the earliest possible moment after the war. It would like also to have the air force program coordinated with the domestic and foreign-service transport program—substantially the same transport planes are used by airlines and Army and Navy. Many aviation leaders have suggested a new aviation board, like the Morrow Board, which in the early '30s laid down civil and military policies that contributed to this country's air progress and leadership.

WARNER & SWASEY UNAFFECTED BY VE-DAY CUT-BACKS

CLEVELAND—Charles J. Stilwell, president, Warner & Swasey Co., personally assured the company's 4500 employees that prospects pointed to more business, and that the company would not be affected by VE-Day cut-backs. Mr. Stilwell told the employees that he was taking them into his confidence, since some of them feared cutbacks, which may have prompted the 125 employees who left the company in recent weeks to quit their job.

Mr. Stilwell pointed out that the company must continue to produce gun drives for the Navy at current levels, that present output rates on the Packard supercharger must be maintained, and that machine tool output must be increased. Moreover, he stated that the Army and Navy wanted the company to undertake additional radar contracts.

New Martin Mariner—The new and more powerful PBM-5 currently in Production at The Glenn L. Martin Company, Baltimore, Md., is the third model and sixth version of the flying boats used by the Navy. They have redesigned cowlings, airscoops, and internal design changes, and are powered by Pratt & Whitney R-2800 engines. The new planes have already been in combat action in search patrols and air-sea rescues

SERIOUS PAPER SHORTAGE

Since over 700,000 different war items are wrapped, packaged, tagged, or made from paper or container board, paper remains a Number 1 war material shortage, even though VE-Day has brought some easing in the situation of other materials. Speeding up of the Pacific War Will require enormous amounts of paper and board since double and triple packing are required for materials shipped to that area, to protect them against weather, insects, long and sometimes rough transportation, and other hazards.

We can all help ease this shortage by: (1) sharing this magazine with your associates, since copies are limited due to the paper shortage; and (2) maintaining a continuous drive in your plant to collect waste paper of any kind to put into paper salvage, cleaning out old files, dead correspondence, obsolete records, useless display materials, etc.

Princeton to Offer Plastics Engineering Research Course

PRINCETON, N. J.—A program of instruction and research in plastics will be instituted by Princeton University, according to an announcement by Professor Kenneth H. Condit, Dean of the Princeton School of Engineering. Believed to be the first program of its type established in this country, it will have the two-fold purpose of meeting the growing demand for men with technical training in plastics and of conducting research in plastics.

The program is being developed with the aid of an advisory committee of sixteen industrialists, headed by George K. Scribner, president, Boonton Moulding Company. In addition, industry has donated equipment and funds for the newly converted plastics laboratory. Chairman of the Inter-departmental Committee charged with the project is Professor Louis F. Rahm, who stated that the university education in engineering and science can no longer neglect plastics.

ASSISTANT EDITOR WANTED

Wanted—An assistant editor for American Machinist. The man qualified to fill this position must be familiar with shop tooling and metal-working operations in general. He should be able to identify practical improvements in machine shop set-ups and to describe them clearly. Interested applicants communicate with the Editor, American Machinist, 330 West 42 Street, New York 18, N. Y.

Names in the News

Charles M. White

Charles M. White has been elected president of the Republic Steel Corp., Cleveland, Ohio, to succeed **R. J. Wysor** who asked to be relieved of his duties to engage in an important new activity. Mr. White for the past ten years has served as vice president in charge of operations. **E. M. Richards,** formerly assistant to Mr. White, was elected to succeed him.

Edwin F. Schwanhausser, manager of the Worthington Pump & Machinery Corporation's Buffalo plant since 1929, is leaving to become vice president in charge of sales at the main office in Harrison, N. J.

Mr. John C. Harrower has been elected vice president of Air Associates, Inc., Teterboro, N. J., in charge of sales and engineering.

W. E. Remmers has been elected vice-president of Electro Metallurgical Co., New York, N. Y., a unit of Union Carbide and Carbon Corp. Mr. Remmers joined the company in 1936 and has served as district and division manager of the Chicago office.

W. E. Remmers

M. C. Pecsok

M. C. Pecsok has been appointed vice president of the Osborn Manufacturing Co., Cleveland, Ohio. Starting to work for the company in 1912 as a cost clerk, Mr. Pecsok has been serving, until his recent appointment, as sales manager of the brush division.

C. T. Burg and **Frank S. Hecox** are newly appointed vice-presidents of the Iron Fireman Manufacturing Co., Cleveland, Ohio. Mr. Burg was formerly sales manager and Mr. Hevox, secretary-treasurer.

Col. G. D. Larner

W. J. Turnbull

Colonel G. deFreest Larner has been appointed assistant to the president of H. K. Porter Co., Inc., Pittsburgh, Pa. Recently returned to inactive status after more than three and one-half years of duty with the Army Air Forces both in England and the U. S. A., Col. Larner will have charge of termination of war contracts.

William J. Turnbull has been named assistant director of procurement for The Glenn L. Martin Co., Baltimore, Md. A member of the Martin Engineering group since 1937, Mr. Turnbull has been business manager for B-26 and B-35 airplanes and has served as director in the development of the company's non-aeronautical products.

Gwilym A. Price has been appointed executive vice president of the Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

N. S. Peterson, vice president of SKF Steels, Inc., New York, has been appointed executive vice president.

Albert L. Bergstrom was elected this month vice president of all engineering for Timken Roller Bearing Co., Canton, Ohio.

Lee A. Daines

Lee A. Daines has been elected vice president and general manager of sales of the Heppenstall Co., Pittsburgh, Pa., where he assumed his new duties on May 1. Mr. Daines, who joined Heppenstall Co. in 1943, has been district manager of the Chicago office for the past eighteen years and has been a director of the company for seven years.

Albert F. Polk, vice president in charge of engineering of The Sheffield Corp., Dayton, Ohio, has been selected by the War Department for a mission in the occupied territory on the Western Front.

Ross H. McMaster, president of The Steel Company of Canada, Ltd., and a director since 1914, was appointed chairman of the board of the company at a meeting of its board of directors on April 23. **H. G. Hilton** was appointed president of the company.

J. J. Huether has been named assistant manager of the Industrial Divisions of General Electric Co., Schenectady, N. Y., and **W. A. Wirene** has been advanced to manager of the Industrial Materials Division.

Boyd V. Giesey has been named to head the recently expanded Flash Welder Division of Progressive Welder Co., Detroit, Michigan.

Robert J. Woods has been named a special technical adviser to **Lawrence D. Bell,** president of the Bell Aircraft Corp., Buffalo, New York. Until his appointment, Mr. Woods had been serving as chief design engineer in the Niagara Frontier Division of the company.

Gorham W. Woods has joined the staff of The Lincoln Electric Co., Cleveland, Ohio, as a research engineer. He will devote a major part of his time to the development of electrodes.

Alfred Iddles and **J. H. King** have been elected vice presidents of The Babcock & Wilcox Co., New York. Mr. Iddles has been serving in the capacity of special assistant to the vice president in charge of engineering and Mr. King as manager of the marine department.

Charles E. Wetherald, general manufacturing manager of Chevrolet Motor Division, Detroit, Michigan, after completing thirty years of service with Chevrolet and over forty years with General Motors Corp., has retired from active business life.

Mr. Frederick G. Schranz has been appointed vice president in charge of hydraulic and special machinery sales of the Continental Foundry & Machine Co., Pittsburgh, Pa.

H. A. Brown of Bridgeport, Conn., has been appointed manager of the Lake City ordnance plant in Kansas City, Mo., to succeed **W. R. Barrett,** who will return to the du Pont Co., at Lowell, Mass.

BUSINESS ITEMS

C. M. Frazier

Food Machinery Corp. has purchased the **Dayton-Dowd Co.,** independent pump company, Quincy, Ill., and will make it a branch of its **Peerless Pump** division, Los Angeles, under the direction of **Clarence M. Frazier,** vice president. **Henry J. McKenzie,** who has been assistant manager of the Peerless Pump division, has been named manager of the new Quincy branch.

Rheem Research Products, Inc., have moved their general offices to the Standard Oil Building, Baltimore, Maryland.

The Baldwin Locomotive Works, Philadelphia, Pa., have formed a Canadian subsidiary with headquarters in Toronto. **W. N. Brownlie** will direct the activities of the subsidiary.

Walter Pestrak

W. F. Grimes

The Duer Engineering Co., a partnership formed by **Walter Pestrak** and **Paul L. Duer,** will represent the **Progressive Welder Co.** of Detroit in Eastern Ohio and Western Pennsylvania. Mr. Pestrak and Mr. Duer have both been identified with resistance welding for many years.

The Progressive Welder Co., Detroit, Mich., will be represented in the Western Ohio industrial area by **Aulerich & Grimes,** recently formed by **A. J. Aulerich** and **William F. Grimes** to handle resistance welding problems for manufacturers in that area.

Kennametal Inc., of Latrobe, Pa., manufacturer of cemented carbide products, is engaged in a plant and equipment expansion program. The expanded facilities will provide 25% greater capacity for making complete machining tools, and 50% greater production of cemented carbides.

The Delco-Remy Division of **General Motors** have purchased a tract of land in New Brunswick as a site for a new storage battery manufacturing plant. Building will commence when government regulations permit.

Surface Combustion Corp., Toledo, Ohio, have consolidated their New York City offices at the Transportation Building, 225 Broadway.

The Cincinnati Electrical Tool Co., Cincinnati, Ohio, have appointed **David H. Turner** as the company's New York manager.

OBITUARIES

Edmund A. Doyle

Edmund A. Doyle, consulting engineer for The Linde Air Products Co., a unit of Union Carbide and Carbon Corp., and a former president of the American Welding Society, died suddenly at his home on May 4. Mr. Doyle began his association with The Linde Co., in 1922. Four years later he became consulting engineer on process development, a position he held until his death.

James A. Laws Jr., second vice-president and treasurer of the Western Auto Supply Co., died April 24th at his home in Kansas City, Mo. Mr. Laws had been associated with Western Auto for the past ten years.

Harry Prouty, associated with the K. O. Lee Co., Aberdeen, South Dakota, died suddenly in Milwaukee, Wis., on April 19. Mr. Prouty had represented the K. O. Lee Co., in Wisconsin, eastern Minnesota, northern Illinois and northeastern Iowa for the past six years. No successor has been named.

Abraham Lipkowitz, 68, president of the Atlas Metal Co., Cleveland, Ohio, died of a sudden heart attack on April 15. He founded the Atlas company thirty years ago.

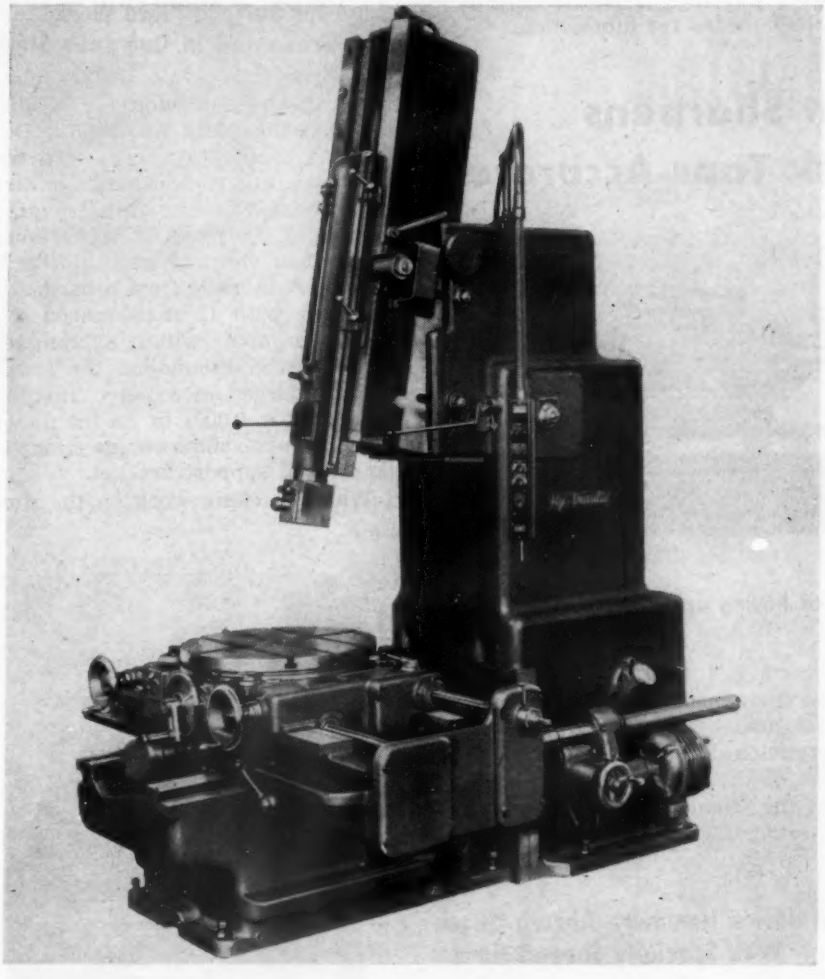
MEETINGS

CANCELLED

Silver Bay Industrial Conference, Silver Bay, New York, July.

Shop Equipment News

Hy-Draulic Slotter with 20-Inch Stroke Provides Automatic Control



Hy-Draulic slotter has all controls and adjustments centrally grouped for convenient operation

The 20 in. stroke Hy-Draulic slotter manufactured by the Rockford Machine Tool Co., Rockford, Ill., has the following general characteristics: Hydraulic ram-drive. Manual and hydraulic longitudinal and transverse feeds, with power rapid traverse. Manual and hydraulic rotary feeds to table, with power rapid traverse. Micrometer dials, graduated in thousandths of an inch, for longitudinal and transverse feeds. Table graduated through 360 deg. Rugged construction of units provides strength for continuous full-capacity operation of machine. Control levers and pushbuttons are conveniently located. Rotating parts are protected by guards. Base, column, ram, table, and related parts are machined to provide accurate alignment. Wipers protect ways from grit, dirt and chips. Provisions are made for taking up wear.

The 20 in. stroke slotter has 24 in. space under the ram guide, and an adjustment of 19 in. in positioning the ram on its hydraulic driver. It slots to the center of a 48 in. circle and has cutting speeds infinitely variable between 10 feet a minute and 60 feet a minute, return speed 1.67 times cutting speed, with tools up to ⅞ by 2 in.

The bed and column are rigidly proportioned and reinforced with heavy cross ribs at frequent intervals to retain alignment under heavy cuts. Column has oil tank in base.

The saddle is designed to withstand heavy cuts and retain its original alignment. The saddle slide on the base has an adjustable gib to compensate for wear.

The table is circular, graduated on the periphery, and provided with T-slots in four directions. Micrometer dials graduated in thousandths of an inch show exact movements of table. Final drive to table is through a worm and wormgear, with suitable adjusting means. Built-in dividing head, and tapered locating pin, are standard equipment.

The ram is proportioned for rigidity, and gibbed to take up wear. It is mounted in an independent housing, pivoted to tilt forward at the bottom to 10 deg. from vertical, and has heavy locking bolts.

Simple means are provided for positioning the ram in relation to the work. Changing the ram stroke is done without cranking, or using tools, by adjusting dogs on the side of ram. The ram movement can be reversed manually at any point in its travel in either direction. The ram head is rigid and proportioned effectively to resist tool thrust. Toolholder has spring clapper box action which can be locked for rigid operation.

The ram has a hydraulic drive from a cylinder mounted directly in its rear. Cutting speeds range from 10 ft. a minute to 60 ft. a minute, and any desired rate within these extremes can be secured by making a simple adjustment. This drive maintains constant pressure

and uniform speeds at the adjusted rate throughout each cutting stroke. If the tool meets extraordinary resistance, the cutting pressure continues at maximum but the forward movement of the tool stops without damaging the machine or the work-piece. Reversals are smooth and cushioned. Lubrication is inherent and continuous. The ram-drive does not have gears, links or other fixed connections to develop lost motion or cause marks on surfaces being machined.

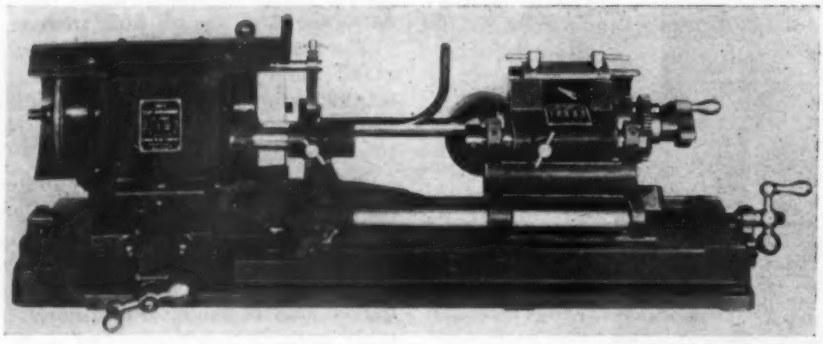
Hydraulic feed to the table is infinitely adjustable between 0- and 0.106 in. per cutting stroke for transverse movement, between 0- and 0.053 in. for longitudinal movement and between 0- and 0.111 in. on a circle 6 in. dia. for circular movement.

Power rapid traverse to the table includes longitudinal, transverse and rotary movements.

The main driving motor is a standard constant-speed electric motor connected directly to the hydraulic pumping unit by a flexible coupling. Mounting is convenient for inspection and servicing. Hydraulic equipment is installed with minimum connections.

Hydraulic system is self-lubricating. Ram lubrication is automatic. All other moving parts and bearings have one-shot, pressure fittings or other means for lubrication.

Grinding Attachment Sharpens Bent and Hook Taps Accurately



Blake tap grinder sharpens taps having up to ten flutes

A grinding attachment for sharpening bent and hook shank taps is announced by Edward Blake Co., 634 Commonwealth Ave., Newton Center 59, Mass. This attachment can be mounted on any Model No. 2 Blake tap grinder now in use.

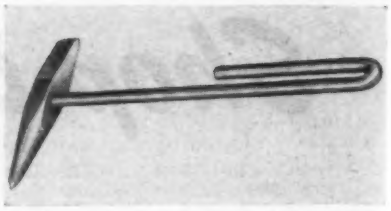
The Blake uses a center to support the front of the tap, and a short grip collet on the shank immediately back of the threads. Tests have proven that this is the most accurate method of holding bent or hook shank taps during the sharpening operation, as on many taps of this type, the shank may not be true with the threads.

The attachment will permit grinding the chamfer on any bent shank tapper tap up to ½-13 used on the ⅛, 3/16, ¼, ⅜ or ½ in. automatic tappers, and any hook shank tap up to 9/16-18 used on ¼, ⅜ or ½ in. precision tappers, as made by the National Machinery Company, Tiffin, Ohio.

Either right- or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes may be sharpened on the chamfer, with any amount of relief desired. Both precision and speed are attained, as the Blake tap grinder is operated in the usual manner when the attachment is used.

Welder's Hammers Absorb Shock With Specially Shaped Handle

Several models of welder's chipping hammers manufactured by the Chicago Manufacturing and Distributing Co., 1928 W. 46 St., Chicago 9, Ill., are available with steel handles. The handles are made of high-grade ⅜-in. round steel and have a special hand grip to absorb shock when chipping and to hook on the welder's belt when not in use. Type E hammer has a combination drift and chisel made for general chipping purposes. Type F is similar to type E, except that the head has two chisels at right angles. Both types can be supplied with a removable wire brush which is fastened to the handle by special clamps and countersunk screw.

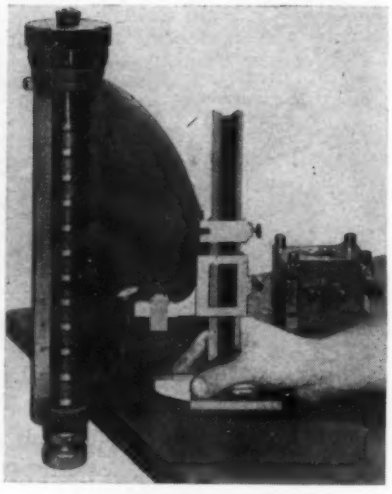


Chicago welder's hammer

Gage for Surface Plate Work Graduated in One Inch Steps

Pla-Chek, a gage for surface plate work, has been developed by Cadillac Gage Co., 20316 Hoover Rd., Detroit 5, Mich. This gage, guaranteed accurate from 0.00005 in. for any size from 0.001 to 12 in. from the surface of the plate, is many times faster than ordinary gage blocks, it is said. It is made from a hardened steel bar with 12 steps spaced exactly 1 in. apart with a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in 0.0001 in. on the upper end of the bar and a simple triangular-shaped support bracket.

When checking work on the surface plate, the micrometer thimble of the Pla-Chek gage is set at zero. The lower end of the bar and the surface plate are now exactly level. The micrometer is set for the desired dimension in thousandths and tens of thousandths. The measurement is taken from the desired inch step.



Pla-Chek height gage

LODGE & SHIPLEY LATHES *at work*

REPAIRING THE MACHINERY OF SHIPS FOR MATSON NAVIGATION CO.

●Matson ships sail to the farthest ends of the Pacific—to Hawaii . . . Samoa . . . Fiji . . . New Zealand . . . Australia . . .

On these voyages lasting many days and covering tens of thousands of miles, ship machinery must function without breakdown. This is the responsibility of Matson's Construction and Repair Department in San Francisco.

Here, Matson depends on many Lodge and Shipley Heavy Duty Lathes . . . kept in constant use turning a multitude of parts, large and small, required for naval machinery.

The new L & S 25" and 27" Heavy Duty Engine Lathes are built to assure just this dependability . . . designed to handle the heaviest types of work with ease, yet to perform equally well on work requiring close limits of accuracy.

Call on L & S Engineers—they'll gladly demonstrate the advantages of these powerful lathes on your work. For detailed literature, write on your company letterhead for Bulletin No. 609.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

Hydraulic Feeds Improve Speeds Of Car Wheel Boring Operations

The Niles hydraulic feed car wheel borer, manufactured by the General Machinery Corp., Hamilton, Ohio, is designed to rough and finish machine, chamfer the bore, and face the hub of cast iron or steel car wheels with a minimum of machining time and effort on the part of the operator.

It is arranged for a manual hydraulic feed and traverse control to the vertical boring bar. If desired, a semiautomatic feed and traverse cycle control, permitting manual control, may be applied to this unit. Both methods have a fine and coarse feed, and fast traverse in both directions. Infinite feed selections, within its range, makes it possible to select the most efficient feed for a particular speed and material.

The machine is provided with a self-centering five jaw automatic chuck table, sufficiently large to permit the chucking of a 48 in. dia. car wheel. Chucking and unchucking is automatic and controlled by two pushbuttons. The table is sealed within itself and the table base to permit the use of cutting fluid and coolants.

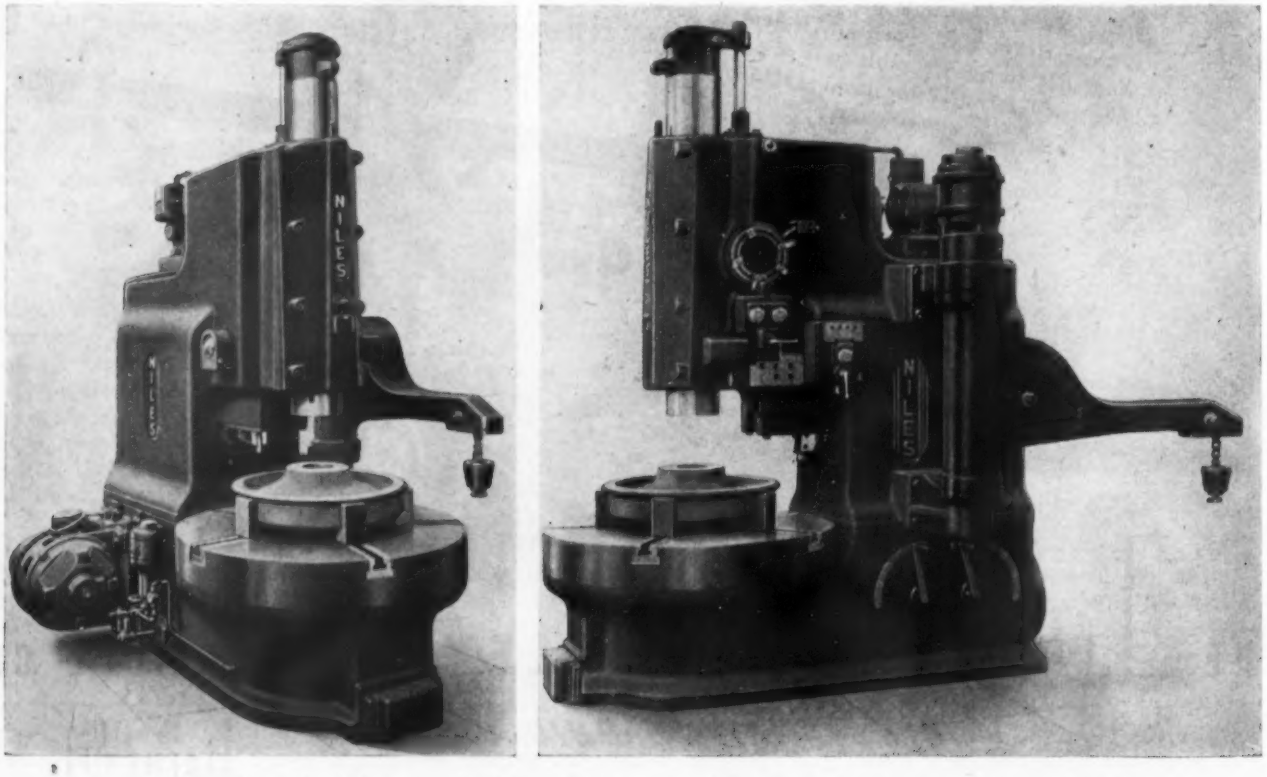
A speed box inserted in the rear of machine frame, completely inclosed and ventilated, provides six speeds to the table arranged in geometrical progression. The whole range may be increased or decreased to suit customer's wishes. Lubrication is automatic. The speed box is driven by a constant speed a.c. or d.c. motor through texrope belts. The motor is mounted on the left side of the column. Gear change levers, easily reached by the operator, provide almost effortless speed selection.

A 15-hp. constant speed a.c. or d.c. motor is required to drive the table, a 3-hp. constant speed a.c. or d.c. motor is required to drive the hydraulic system, a 3-hp. constant speed a.c. or d.c. motor is required for the electric hoist, and a ¾-hp. motor is required to drive the lubricating pump.

The hoist for handling the wheels on and off the table is located conveniently on the operator's side of the machine. It is simple in construction and easy to operate. A 3-hp. constant speed motor, pushbutton controlled, and conveniently located, drives the chain drum. Suitable safety provisions prevent accidents.

Column is a box type, ribbed and reinforced casting, to withstand the strain and stresses imposed upon it. The table base top is machined and bored directly in line with the bearing for the vertical boring bar. This assures permanent alignment with the bore and outside diameter of the wheel. A circular flat table bearing track supports the table, giving a minimum specific bearing pressure. A renewable bronze bush bolted to the base provides the bearing for the table driving bevel gear. This arrangement relieves the table spindle of the radial load caused by the separating force and pressure angle of the table-driving bevel gear. The operator's side is arranged to attach a crane and the table speed change levers. The upper part of the column above table base incases the hub facing bar, vertical boring bar, and completely enclosed in this part are: the feed cylinders, piping and control, and a large hydraulic oil reservoir.

The table is sufficiently large to permit the chucking of a 48 in. diameter car wheel without the jaws projecting beyond the table when the jaws are open. The top of the table is graduated to facilitate the adjustment of jaws from



Controls on the Niles car wheel borer are arranged for manual or automatic operation

Your PRODUCT is only as good as Your GAGES

The fine accuracy of your product can be assured only through the use of fine precision gages such as those made by Cadillac.

And—accuracy pays real dividends, in faster, easier assembly, elimination of hand fitting, reduction of rejects and scrap, higher production of finished work.

Accuracy is the law of the Cadillac plant. From the testing of incoming material to the final inspection of the finished product, every effort is concentrated on making the finest, the most precisely accurate gages it is possible to produce. There are none finer.

More than 10,000 gages in the standard sizes are in stock awaiting your order to ship.

Phone Us
REVERSE THE CHARGES!

We welcome your inquiries as well as your orders and we invite you to phone us regarding any gaging problem what ever—and reverse the charges.

Cadillac GAGE COMPANY

20316 HOOVER ROAD • DETROIT 5, MICHIGAN

maximum to minimum diameter wheels. The outer rim is machined to effect a seal with the table base to prevent cutting fluid from entering the table bearing track and spindle. The cam plate is housed in the bottom of table and is completely enclosed to prevent coolant seepage from entering the table track and spindle. The table-driving bevel gear, almost as large as the table, with its bearing in the base, drives the cam plate which in turn engages all five chuck slides and jaws, simultaneously moving them radially and thereby chucking the car wheel and then revolving the table. This feature assures no slipping of the car wheel during heavy cuts, since the chucking becomes tighter as heavier cuts are taken. Attached to the table is a hollow cast iron ground spindle. The spindle runs in a long tapered bush adjustably mounted in the base. Cutting chips and coolant are permitted to pass through the hollow spindle into a container in the foundation. The brake drum is bolted to the end of the spindle. All mechanism is accessible through an opening in the foundation, and chips can be removed through the same opening.

A large compression type brake table is provided. Its function is to brake the coasting of the table after the main drive motor is deenergized, thus decreasing the floor to floor time for each wheel. The braking and releasing is completely automatic and takes effect every time the table stop button is pressed. A small motor-driven centrifugal pump is bolted directly to the supply tank furnishing fluid to the brake cylinder, which in turn actuates the brake lever.

The speed box is a separate unit. Completely assembled, it is inserted into the rear of the column base, and supported and bolted to it. It has six speeds arranged in geometrical progression.

All gears are properly proportioned, of alloy steel, heat treated. The change gears are mounted on integral spline shafts running in antifriction bearings. No idler gears or clutches are employed. The change gear levers are located in the most practical position for the operator.

A motor-driven lubricating oil pump is bolted to column base opposite operator's side. This pump maintains a constant flow of strained oil to the table track and spindle, and by cascade system to all gears and bearings in the speed box. Sight flow indicators permit occasional check of flow of oil.

A round hollow cast boring bar, ground on the outside, is employed. Its chief advantage is the permanent alignment of the bar, and therefore, of the boring tool with the wheel bore. Any wear taking place is taken up by the tapered bush in the column equally around the circumference of the bar. It is therefore impossible to misplace the center of bar or cutting tool with respect to the center of the wheel bore. The bar is guided in the cap, hydraulically counter-weighted, easily removable, and oiled by a wick system from the top of the column. The lower part is provided with a taper bore, driving key slot, and drift key slot to receive the tool mandrel. The piston rod of the oil feed cylinder is attached to the upper part of bar. A small rack cut integral with the bar drives the automatic feed dog mechanism.

Two entirely separate feed and traverse systems are used; one for the vertical boring bar and one for the hub facing bar. The standard machine is furnished with a hydraulic system for the vertical boring bar only. The feed and traverse panel is bolted to the column directly below the automatic feed dog mechanism. The panel is provided with a coarse and fine down feed adjustment, and a fast traverse in both directions. An operating lever permits the manual operation of the vertical boring bar if so desired.

Pickling Agent Has No Effect On Metals; Throws No Fumes

A pickling agent to remove rust, scale, tarnish, and incrustations of cement and lime from metals is being marketed by Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa. Troxide, as this chemical is named, is a dry, inert compound. It is non-eruptive, non-inflammable, and is said to present none of the occupational hazards common to acids heretofore used in pickling.

It is claimed that Troxide throws off no "acid-mist" or other toxic fumes which are pungent, corrosive, and harmful to workmen and machinery. Tests prove that Troxide attacks the scale, not the metal, and the surfaces are left smooth, clean, and bright; thus, the hazards of over-pickling are materially reduced. Troxide may be used either hot or cold.

Overhead Guards Protect Towmotor Lift Truck Operator

To provide maximum protection for lift truck operators in all cases where they might be endangered by falling objects, Towmotor Corporation, Cleveland, Ohio, has developed overhead guards to fit all Towmotor models. Constructed of rugged steel tubing and easily installed, the guards come in two standard sizes and add to the safety features of the Towmotor lift truck, without restricting or inconveniencing the operator.

When installed, the guards extend in front of, over, and behind the operator. Transverse lengths of 1½ in. steel tubing in front and above are notched and arcwelded to side members of the frame. Back sections of the side frame members are made of 1½ in. standard black steel tubing, while the front sections, which telescope over the back sections, are 2 in. in diameter. Installation of the guards is by means of bolts and clamps which are furnished. A wrench is the only tool required, and no cutting or drilling on the Towmotor frame is necessary.

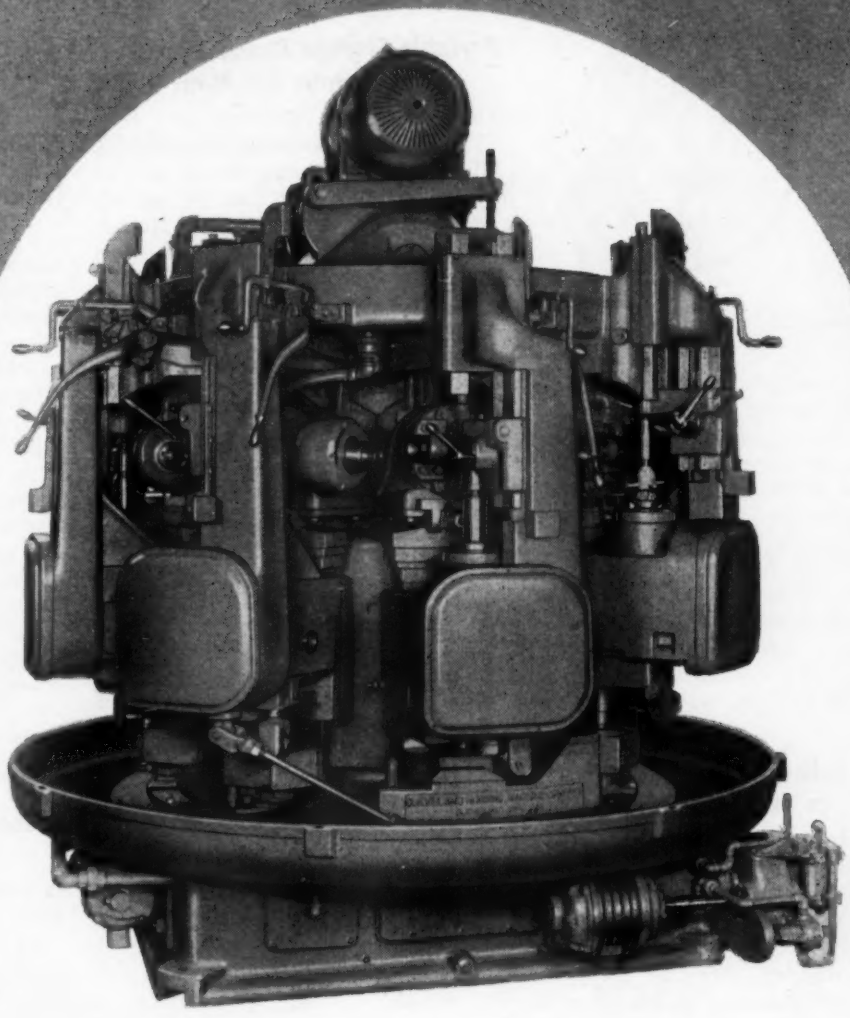
Towmotor truck guards

Welder's Truck Balances to Provide for Ease in Handling

The Palmer-Shile Company, 780 South Harrington Ave., Detroit 17, Mich., are the manufacturers of a Welder's Truck.

Designed to accommodate one gas and one air cylinder, the truck cradles to stabilize cylinders and is thus said to provide for easy handling. Truck handles are equipped

The Rotary RIGIDHOBBER



● This is strictly a high production machine for the hobbing of precision gears and splines.

On the Rotary Rigidhobber eight spindles operate simultaneously. Operations on each of the eight spindles are performed independently of each other during continuous rotation of the eight spindles on the machine base. One job may be completed in a cycle—different jobs may be handled on each spindle—or successive operations may be performed on the same job.

The Operator merely loads and unloads the work—all functions of the machine are automatic. Close accuracy and absolute duplication is obtained by rigid support of the work both above and below hob and by rigid support at both ends of hob arbor during entire operation.

The 8 spindle Rigidhobber handles work up to 6" dia. and 13" long.

Consult Cleveland Hobbing Engineers on your precision gear and spline hobbing work.

This booklet fully describes Rigidhobbers. It tells how they are made — what they do and how they do it. Write for a copy and find out how this high production machine can cut your costs.

●

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

Palmer-Shile welder's truck

with a cross bar on which a Gasaver or torch hanger may be mounted. Hooks welded on the handles provide a convenient place for hanging gas hose when not in use. Tool box is mounted on swivels so that tools are always in level position.

The truck is of all-welded construction. Frame work is of angle iron and sheet metal. Handles are of heavy tubular steel. Overall height is 48 in., width 29 in. Wheels are 24 in. by 2 in.

Safety Splice Equalizes Load In Stranded Rope Splices

American Chain & Cable Company, Inc., Bridgeport, Conn., announces the development of a method for splicing wire rope into slings or various assemblies.

This method develops a neater and more compact splice than is possible by the hand method. The splice is flexible clear to the terminal, and always develops 100 percent of the rope's strength. The Acco-Loc safety splice does not distort the rope structure and maintains equalization of stresses in all strands. The splice applies the load

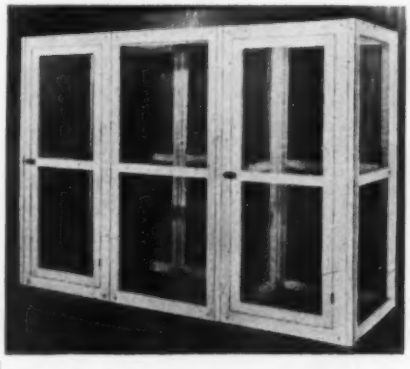
Acco-Loc safety splice

stress in direct line with the pull of the load. It has no seizings to loosen, unravel or get in the way; no wire ends. It is wide open for visual inspection at all times. It may be used with any standard fitting, hook, ring, shackle, thimble, or other, and when the sling or assembly is retired the fittings may be salvaged and re-used.

Portable Storage Rooms Provide Safe Storage for Many Items

Developed by Drinkwater, Inc., 2323 S. Michigan Ave., Chicago 16, Ill., portable storage rooms are so designed that they can be set up anywhere for temporary or permanent storage of food, supplies, tools and numerous types of equipment.

Drinkwater portable storage rooms can be installed as individual rooms or in batteries of adjoining rooms. These batteries can be set up in single rows with a common wall separating the individual rooms, or in double rows connecting back to back, with a common wall or partition between the two rows.



Drinkwater storage room

All door panels come equipped with padlock-type hasp and the rooms themselves are complete.

Drinkwater portable storage rooms are constructed with wood frames, 1⅛ in. thick, mortised and tenoned, with all joints glued. The frames are covered with heavy galvanized wire screening. The panels interlock in such a way that rooms or batteries of rooms can be assembled or dismantled without the use of tools, screws or nails. Complete units, with ceiling panels, are rat and mouse proof as well as pilfer proof, states the manufacturer. These storage rooms provide ventilation and passage of light. Because they are light in weight, they can be moved from room to room. Provision has been made for anchoring to the floor where this is desired. Wall, door and ceiling sections can also be supplied with solid panels, or expanded metal screenings, instead of hardware cloth screening.

Sylvania cathode ray tubes

Industrial Cathode Ray Tubes For Oscilloscopes Announced

Cathode ray tubes for industrial apparatus and oscilloscopes for the study and inspection of electrical wave forms and the measurement of electrical voltages, currents, and frequencies and other production and laboratory services are available from Sylvania Electric Products, Inc., Emporium, Pa. Tubes for replacement and original equipment feature rugged construction, long life and uniform electrical characteristics. Standard 3AP1, 3BP1, 5AP1, 5BP1, 5CP1 and 5HP1 RMA types are produced and similar tubes may be supplied with P4 or other special phosphors. Cooperation with special designs unusual or experimental applications is offered.

Laboratory Oven Designed for Volatile Solvent Experiments

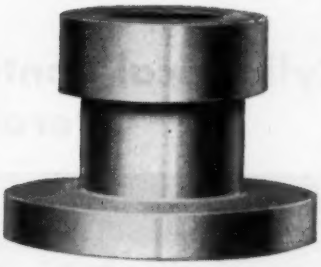
A compact self-contained oven has been designed for laboratory and pilot plant use by the Industrial Oven Engineering Co., 11621 Detroit Ave. Cleveland 2, Ohio.

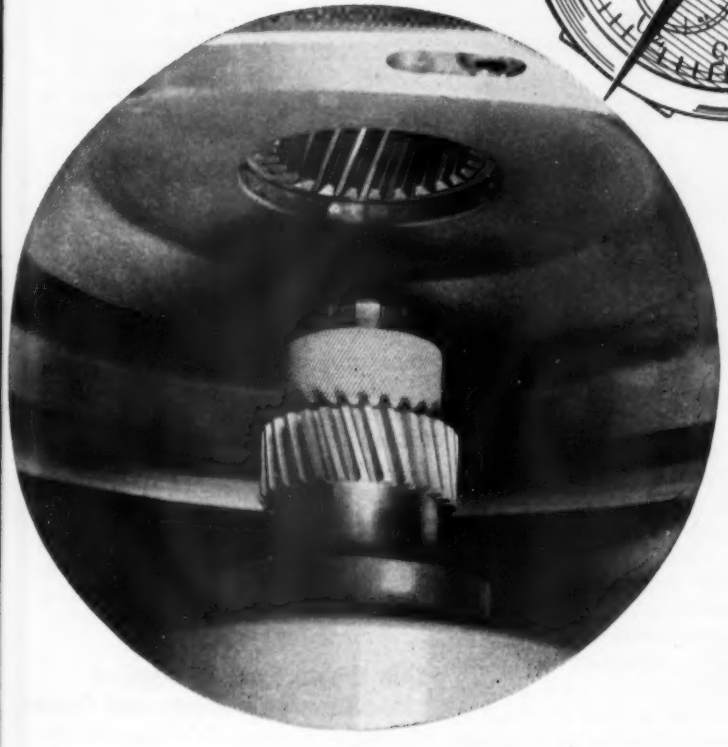
Sizes of oven working space in the oven range from 3 × 3 × 3 ft. to 6 × 6 × 6 ft., in increments of 1 ft., and special sizes are furnished to specification. Temperatures range up to 900 F., with a differential of ± 2 F. This type of oven is usually furnished with electrical heating equipment, but is designed to use any type of fuel. In every case, the heating equipment is contained within the oven shell. The smaller models are fully assembled, ready to connect to the heat source.

The oven is designed particularly for precision experimental work in drying, baking evaporating, polymerizing, aging and heat treating, especially in cases where highly volatile solvents are used.

It can be furnished with special construction to withstand corrosive fumes, and can be furnished with exterior baked enamel finishes in a variety of colors to harmonize with surroundings. Automatic temperature controls are provided.

In 30 seconds





on the SHEAR SPEED

Cutting all teeth simultaneously, the Michigan Shear Speed will produce semi-finished helical gears, spur gears or splines as fast as you can finish them on a Michigan shaving machine. The gear shown, a 2¼ inch diameter, 27 tooth helical is currently being cut in 30 seconds each.

For information on the Shear Speed Machine and Process, ask for Bulletin 1843-44

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

Cylindrical Control Cab Permits Overall Vision for Operators

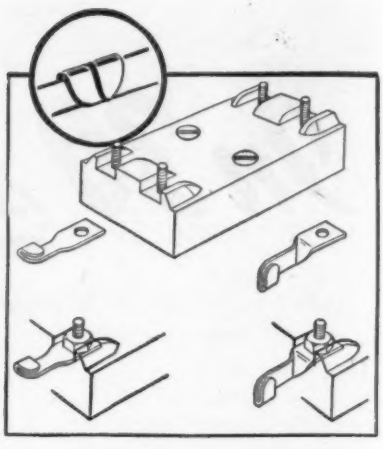
Cleveland crane-control cab protects the operator from fumes and dust

A cab design for overhead traveling cranes has been developed by the Cleveland Crane & Engineering Co., Wickliffe, Ohio, which includes full vision for the operator, comfortable sit-down control and air conditioning. Corners or blind vision spots are eliminated. Ample room is provided with no waste space. The transparent enclosure panels extend to the floor, permitting maximum vision in every direction over the area covered by the crane. The panels are of plastic which is shatter-proof and impervious to certain gases common in many plants that may be injurious to glass.

With this cab, crane operation becomes a sit-down job. Master switches especially designed for magnetic control are located for greatest convenience. Hoist and trolley switches are attached to the right and left arms of the chair. The bridge switch is on the floor and controlled with the right foot. There is a definite control job for each of the operator's hands and feet, but none of his limbs need serve a double duty. The chair is designed to minimize operator fatigue and is located in the cab to give the best position for full view of all working operations. At no point in the operation of the crane is the operator required to change from this position.

An air-cooled air-conditioning unit, especially designed for this cab, provides fresh clean air at any temperature desired and gives protection against objectionable gases, dust and fumes. The unit attached to the cab is for use where temperatures do not exceed 140 F. Adequate sealing and insulation is provided to assure against excessive losses. Another feature is the traveling platform which serves both as vestibule to the cab and a means for easy access to the entire exterior side of the window for cleaning purposes. Safety locks on both platform and cab door prevent operation of either except when platform is in proper position.

This cab is a self-contained unit that may be furnished with any new crane employing magnetic control and it may be applied to existing cranes of any make.



Aircraft-Marine terminals

Adapters Convert Assemblies To Quick-Disconnect Wiring

Knife-Disconnect component parts are manufactured by Aircraft-Marine Products for conversion of any existing electrical assembly to use with the Knife-Disconnect splicing terminals.

The preformed, quick-disconnect adapter member is installed in the assembly in the same manner as the solder tab it replaces; however, it terminates in a knife-disconnect end which accommodates the knife-disconnect terminal. Quick connections and disconnections are made by engaging the terminal to the disconnect and by means of a knife-switch wiping action. The connected terminal is in 4-point contact to assure maximum electrical and mechanical performance.

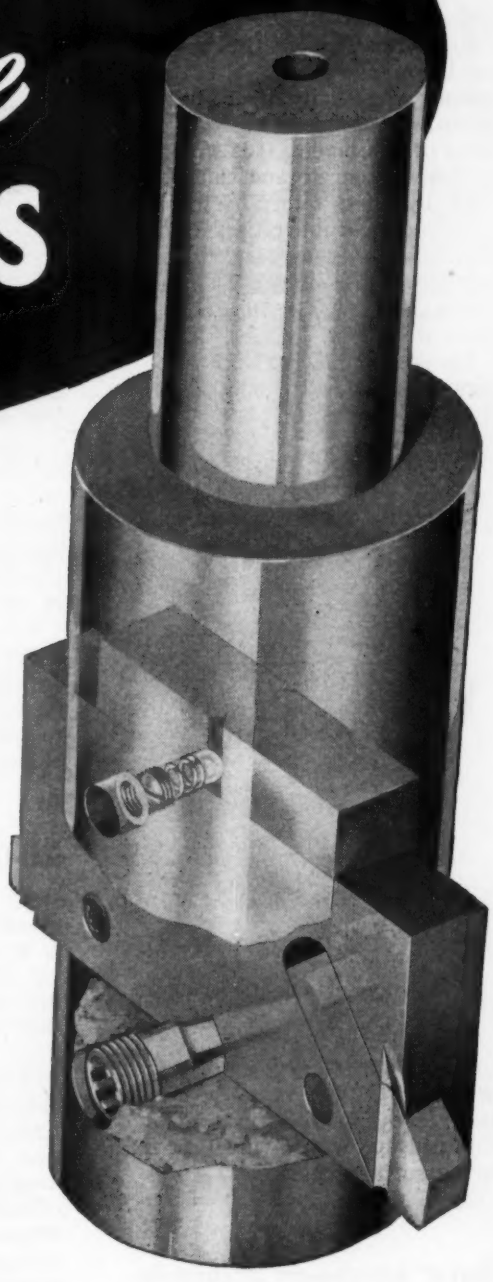
Adapters for vertical or horizontal conversion for wire sizes from 22 to 10 are available.

Skin Cream Protects Against Harmful Irritants and Fumes

Sealskin, a protective skin coating, is made to conform to the type recommended by the U. S. Public Health Service as best suited to protect the skin against solvents and oils. It is manufactured by the Cadet Laboratories, Worcester 5, Mass., and may be applied to tender skin or over broken skin, as it is both non-irritating and non-sensitizing. Placed in the nostrils, it protects the membranes against fumes, sprays, dusts, powders and other irritants, and, containing no water, it may be used by the outdoor workers with no danger of chapping.

Sealskin was made primarily to protect the skin of industrial workers against water solvent cutting

McCROSKY *Block Type* BORING BARS



● This sectional view shows the patented and service-proved features that enable McCrosky boring bars to speed up production, cut your costs.

The centralizing V locking device, hardened and piloted, centers the cutter block with extreme accuracy and holds it rigidly while boring. Retracting the V lock permits the cutter block to be floated the exact amount desired for making finish cuts. The hardened thrust block, held in place with a ball and spring, takes the thrust of the cut, and can be slipped out when the V lock is released, permitting the cutter block to be removed easily and quickly. The blades are held rigidly in the cutter block with an adaptation of the McCrosky time-tested pin and screw locking device, and fine pitched screws in back of each blade permit accurate and uniform blade adjustment, holding to a minimum the amount of stock lost in regrinding.

Furnished in a wide variety of standard sizes, with High Speed, Cast Alloy or Carbide tipped blades. Send for Bulletin No. 16-B—It gives full details—and "Specify McCrosky" on your next boring bar order.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS

Block Type BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS

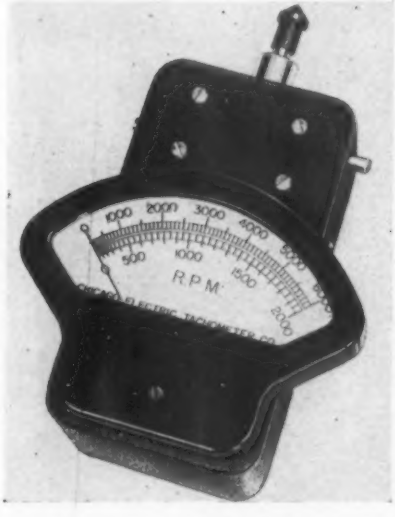
Turret TOOL POSTS

oils and coolants, petroleum products, tar coal derivatives, prussian blue oils, chlorinated hydro carbons, acids, alkalis, caustics and other solutions.

Portable Hand Tachometer Not Affected by Vibration

The Chicago Electric Tachometer Co., 800 N. Clark St., Chicago 10, Ill., are the manufacturers of a self-energizing precision instrument for measuring speeds of rotation or motions of equipment. It is small, compact and accurate and can be operated in close quarters by lightly pressing the rubber-tipped shaft of the tachometer against the revolving or moving object. The speed is nistantly indicated in r.p.m. on a scale over 3 in. long.

Model 5-E Tachometer is so designed and constructed that normal



Chicago electric tachometer

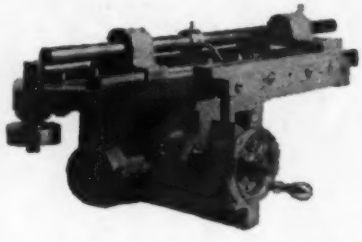
machine vibrations do not interfere with the readings. There is no internal gearing of any kind and it can be furnished with a wheel for measuring surface speeds.

Turret Attachment Accurately Bores Tapers and Profile Holes

An attachment that is intended to simplify the boring of tapers and profile holes with turret lathes and hand screw machines has recently been placed on the market by the Artisan Tool & Cutter Co., 531 Vester Street, Ferndale 20, Mich.

Known as the Reeve taper and profiling attachment, the device can be set so that it does away with the trial-and-error method of producing the right taper. When it is set for a certain taper, the first piece bored will have the taper specified. The size and taper at the face of the stock are held the same from piece to piece, regardless of variations in the length of the stock.

Either tapered or straight holes can be bored without making any



Artisan taper attachment

change in the set-up except for moving back the top slide. Once set for a hole of specified size and taper, the attachment controls the boring operation. The only care required of the operator is to maintain the same dial setting, which remains constant regardless of variations in the length of the stock.

The attachment is mounted on any hand screw machine or turret lathe without interfering with other tools on the turret. It is also adaptable to some Bullard and chucking machines.

Self-Lubricating Bearings Useful in Inaccessible Places

Morganite self-lubricating bearings, a product of the Morganite Brush Co., Long Island City 1, New York, are available in compositions of carbon, graphite or both. They are also supplied, if necessary, with various metallic contents for special applications. Bearings of these materials have these properties self-lubrication immunity to acids, alkali and most solvents. They have low coefficients of friction and expansion. Wear is negligible on the bearings as well as contacting surfaces. In operation Morganite bearings glaze contacting surfaces with a protective coating. They impart no odor or taste to liquids and are used in chemical and food processing industries. The material used in Morganite bearings is non-corrosive and may be applied in contact with any metal.

Morganite bearings are readily machineable and may be molded with tolerances to 0.001 in. They can be machined to close accuracy or superfinished. Outside diameters of ⅛ to 15 in. are permissible. They may be supplied in any shape—complex sleeve or split types, with any contour required. If necessary, the bearing can be molded with inserts.

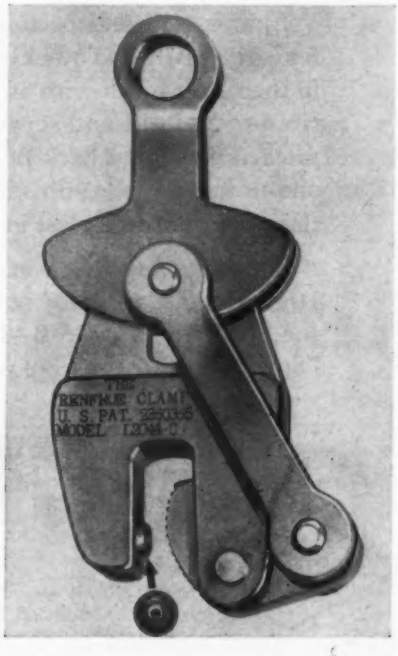
Operating speeds are up to 50,000 r.p.m. with thrust loads to 30 lb. per sq. in. but loads to 2000 lb. per sq. in. at slower speeds are possible.

Lift Clamp for Steel Plate Grips by Positive Cam Action

The Renfroe clamp for lifting steel plate is a product of the Paul Henry Co., 2037 South La Cienega Boulevard, Los Angeles, Calif. The use of cable sliding through rings or guides to actuate the gripping cam is eliminated.

Through the action of the gripping cam shackle, the work is gripped firmly when tension is applied to the lift by the crane even though the body of the clamp is in a horizontal position. The operator does not have to hold tension by means of a cable.

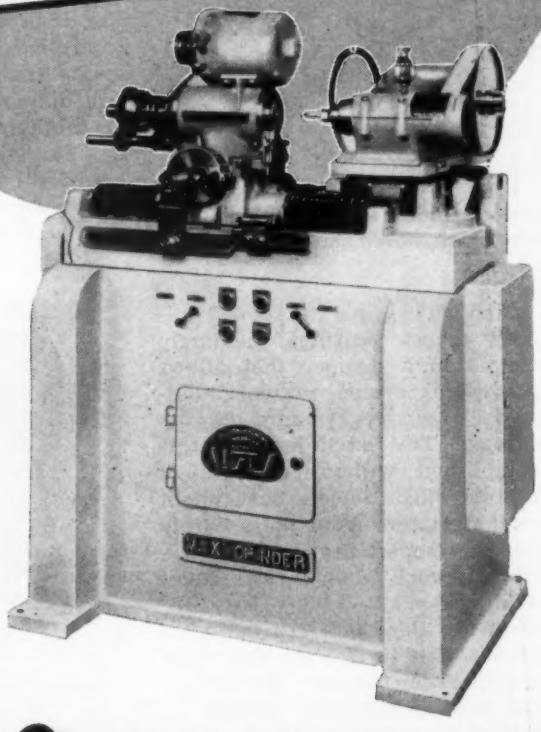
In conjunction with the gripping cam, the swivel jaw is said to provide a deeper and more secure bite on the plate. Swivel jaw and gripping cam, and all other working or stationary parts of the Renfroe clamp are replaceable. The clamps are available in 1, 1½, 3, 5, 10 and 20-ton capacities.



Renfroe lift clamp

Here is An Innovation In INTERNAL GRINDER DESIGN *that offers*

WIDER RANGE
SIMPLICITY OF OPERATION
SPEED and PRECISION



Choose the Maxi-GRINDER for ultra-finish and extreme accuracy on *any* internal grinding operation. The features listed below qualify this unit for your toughest jobs.

Convenient grouping of controls leaves operators right hand free for loading and unloading work head.

Entirely automatic collet opening and closing.

Mechanical differential unit drives grinding-spindle carrier —eliminates bell-mouth holes.

Easily adjusted stroke length adapts unit to shoulder and blind hole grinding.

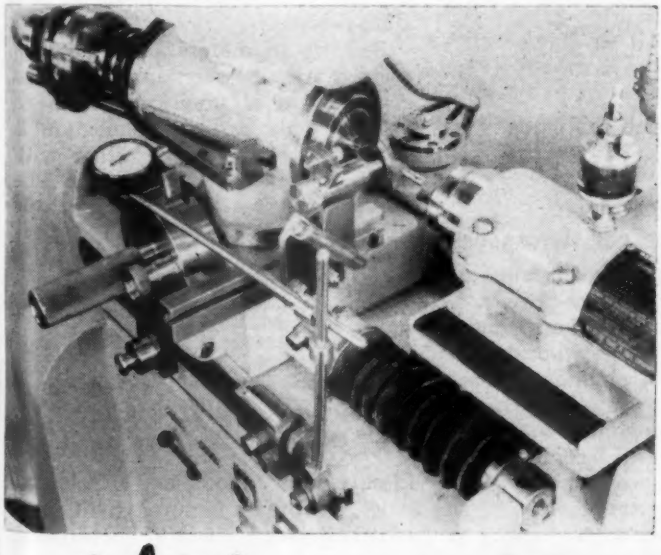
Six spindle speeds, can be slowed quickly for wheel dressing.

Micrometer feed on diamond wheel dresser quickly adjusted.

Totally enclosed feeding mechanism is free of backlash, protected from dust.

Built in sine bar simplifies taper and angular hole grinding.

Separate motors provided for each operation. Push buttons control all functions.



Order your copy of the new *Maxi-GRINDER* Catalog . . . no obligation

Please send the new Maxi-Grinder Catalog to me at once.

Name .....

Company .....

Street .....

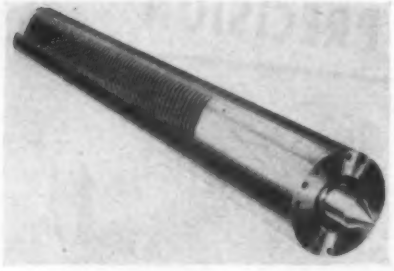
City .....

State .....

Wilson MACHINE PRODUCTS CO.
1231 Beaufait Ave.
DETROIT 7, MICH.

Live Center Tailstock Spindle Compensates for Heat Expansion

The compensating live center tailstock spindle manufactured by Pope Machinery Corp., Haverhill Mass., provides for axial movement to take care of work expansion without losing any of the accurate centering support furnished by the preloaded radial bearings. The spindle is mounted on oversize precision bearings, properly preloaded and having abundant capacity to carry the radial loads. The end thrust



Pope live center tailstock spindle provides axial movement for expansion

is taken on a separate set of preloaded thrust bearings yieldingly mounted in a manner that allows for work expansion without building up excessive pressure on the bearings. This axial movement is accomplished without the use of slides or other devices that might permit deviation from the accurate centering support provided by radially preloaded double-row roller bearings.

With this Pope tailstock the operator has only to set up the work and adjust the center. No further adjustment is required. Sealed lubrication is a feature of this tailstock spindle. It assures uniform, trouble-free operation for the life of the bearings. The spindle is not dependent on the operator for lubrication or adjustment.

The center of the live center tailstock is readily removable without disturbing the bearings. This spindle is capable of supporting workpieces weighing ten tons or more. Centers for lathes of all sizes are available with this automatic compensation feature.

Resinous Impregnators Permeate Varying Casting Porosities

A series of casting sealants produced by the Monsanto Chemical Co., St. Louis 4, Mo., replaces tung oil for impregnation of aluminum and magnesium airplane parts. They make a three-dimensional permeation of the castings without changing their appearance or affecting precision tolerances. After being impregnated, the castings are heat-treated to change the impregnant from a liquid to a rubbery solid form. Parts may be subsequently machined, although the casting is usually fully machined before impregnation.

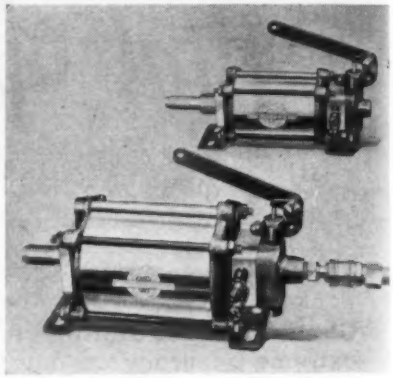
The sealants are identified as being of the Thalid X100 series. These are special adaptations of polyester type resins used in low-pressure lamination. They are thermosetting solutions, a mixture of base resin and styrene monomer. By varying the ratio of the two, the viscosity of the impregnating solution can be controlled to meet varying requirements arising from variation in the size of porosities in aluminum and magnesium. The solution is applied by positive pressure of vacuum-pressure impregnation. The material is non-corrosive and insoluble under normal service conditions.

Thirteen models are made

Centrifugal Pumps Deliver High Volume per Horsepower

The Superflo centrifugal pumps are a product of the Gray-Mills Co., 1948 Ridge Ave., Evanston, Illinois. Higher volume delivery per horsepower and ease of maintenance are features of these pumps. The heavy duty motors are mounted integrally to the pumps for compactness, strength, and to provide a streamlined design. The pump motors range in various sizes—1/25, ⅛, ¼, and ½ hp. with volumes of 9 to 75 gal. per hr.

There are 13 basic models available with various voltage characteristics. There are types for horizontal-external mounting; for vertical-external mounting; and other pumps with floating impellers are made for submerging in coolant system reservoirs. The latter may be used for fluids having abrasive content. Grease-sealed motor bearings and mechanical seals of the pumps require no lubrication.



One air connection is required

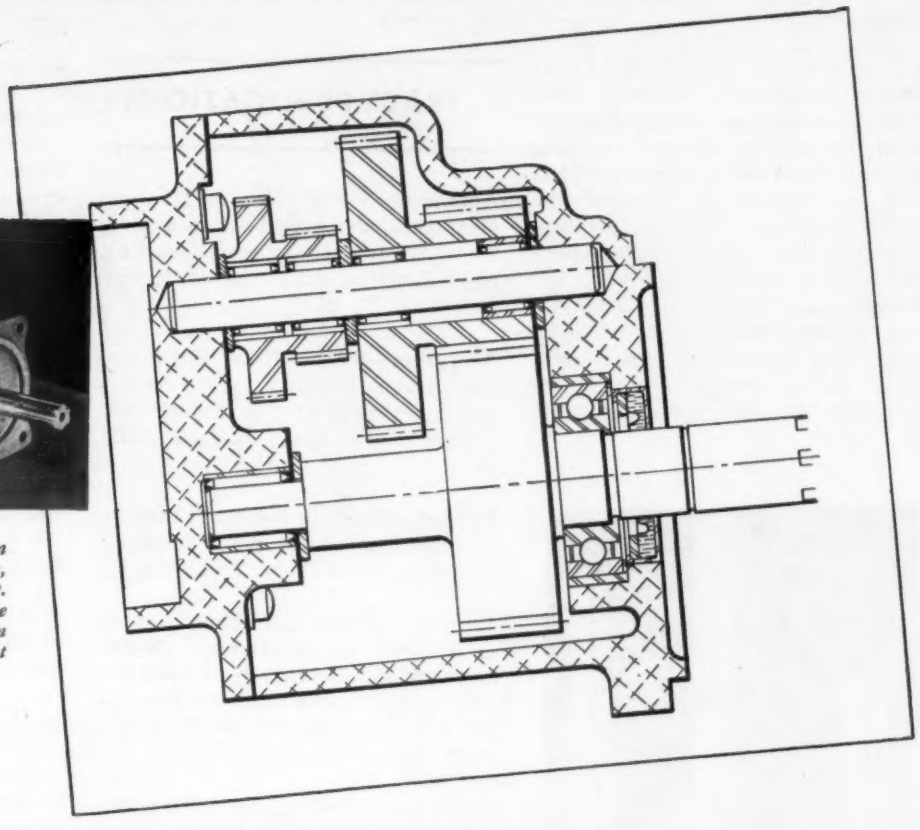
Reciprocating Air Motor Has Integral Valve, Speed Control

A more powerful "big brother" to the Bellows BM5 Air Motor is manufactured by The Bellows Company, Akron 10, Ohio. The BM10 develops more than twice the piston thrust force of the standard BM5 motor on a given air line pressure. (10.32 against 4.9 times the operating air line pressure.) It retains the same basic principal of integral valve, operating and speed controls of the BM5 model.

Bellows air motors are air-driven reciprocating power units. They operate on any air line pressure up to 175 lb. Only one air connection is required which may be either with flexible air hose or rigid piping. The valve operating lever is adjustable to "any angle in any plane" permitting connection and synchronization to any reciprocating machine movement.

Phototube Actuator Controls Processes by Light Intensity

Photoswitch photoelectric control type A20C manufactured by Photoswitch Incorporated, 77 Broadway, Cambridge 42, Massachusetts, provides precise control of operations in foundry and other processes because of its ability to detect minute changes in light intensity. An adjustment on the control housing



X-section shows 5 of the 7 anti-friction Needle Bearings used on Air Associates, Inc. gear reduction drive for aircraft. This is typical of Torrington Needle Bearing use to get the high anti-friction performance from small design weight and space.

Needle Bearings Give Increased Design and Operating Efficiency to Gear Reduction Drives

Torrington Needle Bearings combine unusually high load capacity into a small, compact bearing with low coefficient of friction that offers many design advantages. That's why, in the widely used gear reduction drive made by Air Associates, Inc. for the retractable landing gears, canopies and other moving parts of so many fighter aircraft, the gears and shafts turn on these modern anti-friction needle bearings.

Torrington Needle Bearings are light in weight and compact, yet engineered to stand up to high speeds and heavy loads. They also permit other weight and space savings in the design of housings and other component parts . . . are easy to install, maintain and lubricate!

Why not have these Torrington Needle Bearing advantages on the tools or machinery you design, build or operate? Our Catalog No. 32-A is packed with useful data on anti-friction Needle Bearing applications ranging from kitchen appliances to textile and agricultural machinery. You should have this helpful data in your engineering and design files. Drop us a line and we'll gladly send you a copy.

•

THE TORRINGTON COMPANY

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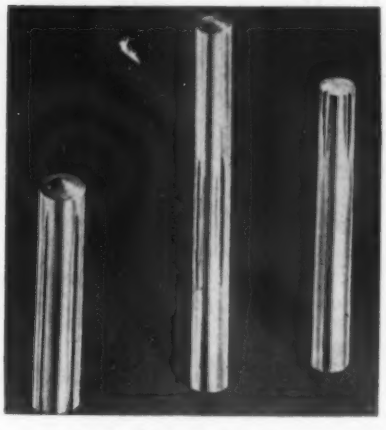
New York Boston Philadelphia Detroit Cleveland
Seattle Chicago San Francisco Los Angeles Toronto
London, England

TORRINGTON NEEDLE BEARINGS

may be set so that the control will remain inoperative at one level of illumination, but will be actuated when the amount of light reaching the phototube varies slightly. It is used to indicate and control the density of gases as well as turbidity in liquids. Control type A20C operates from a supply of 115 volts a.c. 60 cycles and incorporates a single-pole double-throw relay for normally open or normally closed operation. Relay contacts are designed to handle 10 amp. a.c. or 5 amp. d.c.



Driv-Lok pins

Self-Locking Pins Expand Grooves to Provide Firm Grip

The Driv-Lok Pin Company, 565 W. Washington St., Chicago, Ill., are manufacturers of standard and special self-anchoring, vibration-proof pins, which are designed to replace taper pins, keys, cotter pins, set screws and rivets. These pins, which are pressed or driven into standard drilled holes, have four flutes on the surface parallel to the axis. The length and position of the flute can be controlled so that fully or partially grooved pins are available. Fully grooved pins have a pilot at one end so that the pin can be easily inserted.

The raised, work-hardened edges of these flutes provide an expanded diameter of a few thousandths greater than the nominal diameter of the pin. When the pin is inserted in a drilled hole, these raised edges are compressed inwardly, providing a resilient, self-locking element which, it is claimed, will hold indefinitely under vibration or shock conditions. They are available in sizes from 3/64 to ½ in. dia. and from 3/16 to 4½ in. in length, in any material, and in a wide variety of types.

TRADE PUBLICATIONS

Abrasives—Form No. 625 about "Durabonded" coated abrasives which resist heat and retard loading. Behr-Manning (Division of Norton Co.) Troy, N. Y.

Abrasives—Book "How Carborundum Serves Industry," gives history and description of the subject. The Carborundum Co., Niagara Falls, N. Y.

Benders—Bulletin No. 58-T Tangent Benders for sheet metal industry. Struthers Wells Corp., Titusville, Pa.

Brazing—Leaflet describing several appliances for soldering, electric marking and etching. Handbook No. 143 covers tools and equipment. Ideal Commutator Dresser Co., 1292 Park Ave., Sycamore, Ill.

Broaching, Grinding and Milling Machines—Publication M-1322 gives complete engineering data about the various sizes of these machines manufactured by the Cincinnati Milling Machine Co. Each size of machine is covered in respect to line drawings, general dimensions including floor space and height, weight and general specifications so that shop layouts can be made. Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Broaching—Bulletin VAS-45, reviews single-ram broaching machines for surface broaching. Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich.

Chain—Bulletin No. 460 describes corrosion-resistant Z-metal for chain belts. Chain Belt Co., Milwaukee 4, Wis.

Controls—Bulletin No. Z6300 describes electronic control equipment supplied by Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, Ill.

Conveyors—Zig-Zag continuous power conveyor is described in catalog No. A-83. Richards-Wilcox Mfg. Co., Aurora, Ill.

Drills—"Correct Drill Pointing" booklet illustrates methods for various types of drills. Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.

Drives—Bulletin V-1400-B10A describes "Allspeed Drives," giving horsepower and torque data, and mounting dimensions. Worthington Pump & Machinery Corp., Standard Products Div., Harrison, N. J.

Furnaces—Bulletin 418 describes and illustrates wire and strip mill furnaces. W. S. Rockwell Co., 50 Church St., New York 7, N. Y.

Gears—Technical Bulletin 900-44 gives complete specifications with list of standard and special items about crossed axis gear shaving. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Grinding—Bulletin presents data on the Sterling Easymounts and wheel. The Sterling Grinding Wheel Div. of the Cleveland Quarries Co., Tiffin, Ohio.

Inserts—Form 1068A illustrates applications and gives dimensions for various types of Rosan Locked-In inserts and studs. Bardwell & McAlister, Inc., 911 N. Orange Dr., Hollywood 28, Calif.

Mills—Booklet describes and gives standard sizes of "Helex" end mills. National Twist Drill & Tool Co., Rochester, Mich.

Noise—Booklet "Noise Primer" gives compilation of elemental principles and procedures for sound and vibration measurements. General Radio Co., Cambridge 39, Mass.

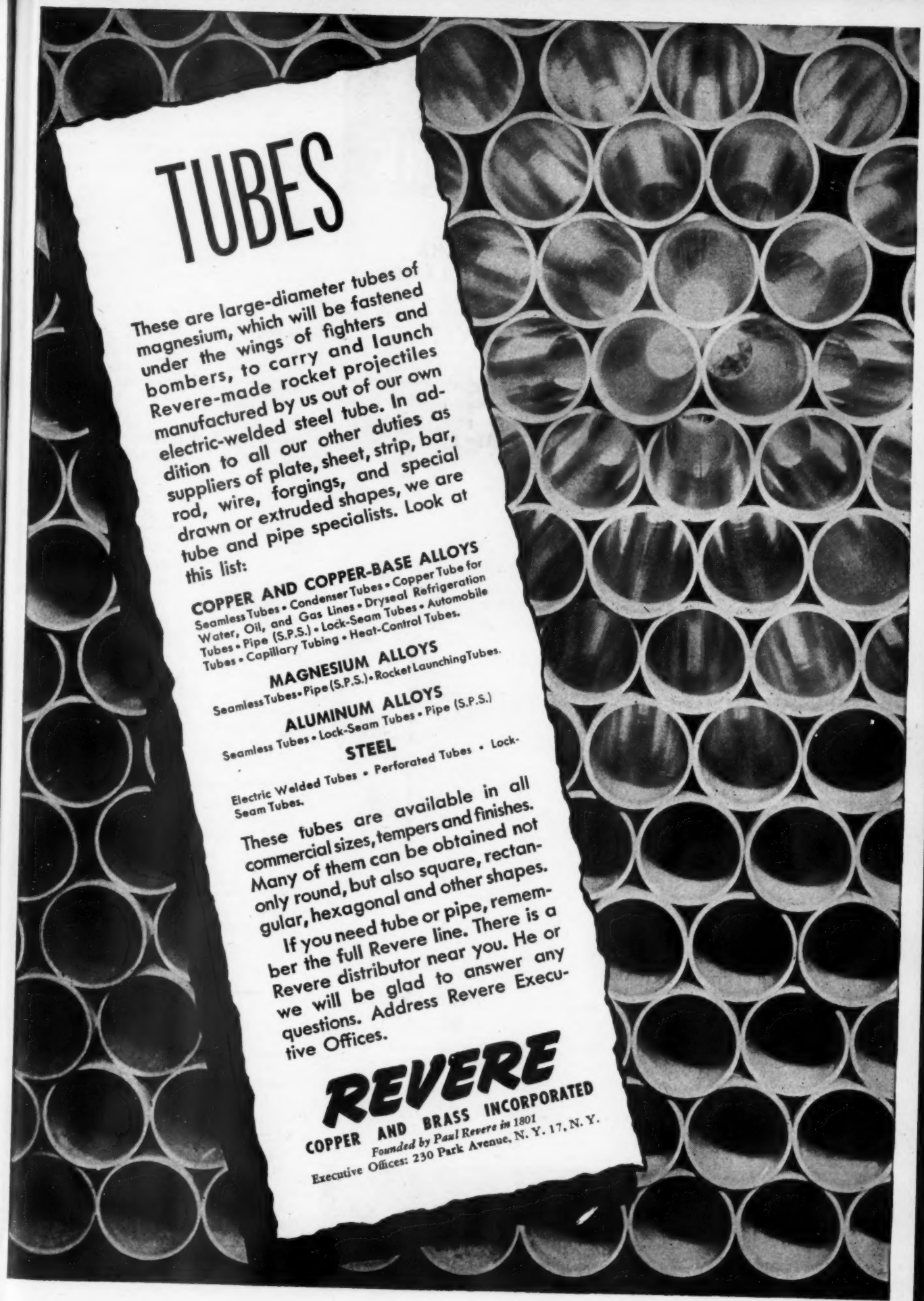
Packing—Handbook on leather packings, illustrates many applications with diagrams of types manufactured. Chicago Belting Co., Green and Washington Sts., Chicago 7, Ill.

Plastics—Leaflet gives general properties of various kinds of plastics. E. I. du Pont de Nemours & Co. Inc., Plastics Dept. S, Arlington, N. J.

Plastics—"A Business Man's Guide to the Molding of Plastics." Use letterhead when requesting a copy. Kurz-Kasch, Inc., Dept. 7-V, 1415 S. Broadway, Dayton 1, Ohio.

Plastics—"Looking Ahead with Leckna" is a booklet describing manufacturing facilities of the Leckna Co., 223 St. and Northern Blvd., Bayside, N. Y.

Presses—Leaflet illustrates types of presses and extruded shapes. Schloeman Engineering Corp., 1100 Empire Bldg., Pittsburgh, Pa.


TUBES
These are large-diameter tubes of magnesium, which will be fastened under the wings of fighters and bombers, to carry and launch Revere-made rocket projectiles manufactured by us out of our own electric-welded steel tube. In addition to all our other duties as suppliers of plate, sheet, strip, bar, rod, wire, forgings, and special drawn or extruded shapes, we are tube and pipe specialists. Look at this list:
COPPER AND COPPER-BASE ALLOYS
Seamless Tubes • Condenser Tubes • Copper Tube for Water, Oil, and Gas Lines • Dryseal Refrigeration Tubes • Pipe (S.P.S.) • Lock-Seam Tubes • Automobile Tubes • Capillary Tubing • Heat-Control Tubes.
MAGNESIUM ALLOYS
Seamless Tubes • Pipe (S.P.S.) • Rocket Launching Tubes.
ALUMINUM ALLOYS
Seamless Tubes • Lock-Seam Tubes • Pipe (S.P.S.)
STEEL
Electric Welded Tubes • Perforated Tubes • Lock-Seam Tubes.
These tubes are available in all commercial sizes, tempers and finishes. Many of them can be obtained not only round, but also square, rectangular, hexagonal and other shapes.
If you need tube or pipe, remember the full Revere line. There is a Revere distributor near you. He or we will be glad to answer any questions. Address Revere Executive Offices.
REVERE
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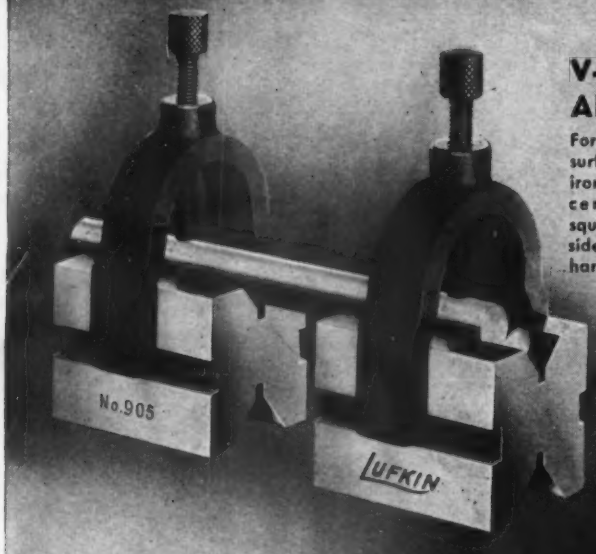
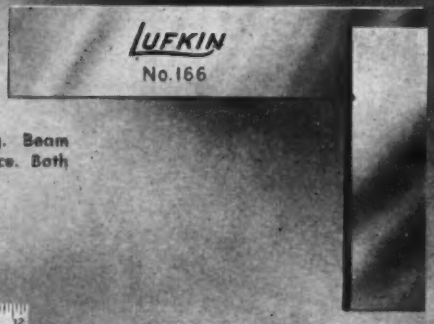
LUFKIN TOOLS
FOR PARTICULAR WORK



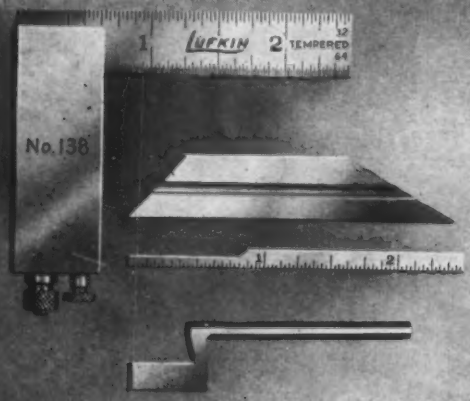
V-BLOCKS AND CLAMPS

For laying out work with surface plate or angle iron. The V's are ground central, parallel and square with the ends and sides. Made of tool steel, hardened and ground.



HARDENED, SOLID STEEL SQUARE

A master square for accurate checking. Beam is solid, being constructed in one piece. Both beam and blade are lapped.



DIEMAKERS SQUARE

Blades slide in the head and can also be adjusted at an angle with the stock. Heads hardened and ground. Available with Standard, Bevel, Narrow and Offset Blades.

For complete facts about these or any other Lufkin Precision Tools, SEE YOUR DISTRIBUTOR. Write for free catalog.

LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

Rectifier—Engineering manual about selenium rectifiers primarily intended for design engineers. Fansteel Metallurgical Corp., Rectifier Div., N. Chicago, Ill.

Sander—Leaflet describes Sand-O-Flex sanding machine. Exactone Tool & Die Co., 4373 Melrose Ave., Hollywood 27, Calif.

Separator—Bulletin 151-C presents information on magnetic-automatic coolant chip separators. Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill.

Sheet, Tubing, Wire—Leaflet 1A-22 deals with sheet, wire and tubing of laminated metal or solid precious metals. D. E. Makepeace Co., Attleboro, Mass.

Steel—Booklet illustrates the range of uses of steel in wartime. Jones & Laughlin Steel Corp., Pittsburgh, Pa.

Typewriter—Book "Vari-Typer, a New Tool for Business" gives examples of the many uses of this machine. Use letterhead when requesting a copy. Ralph C. Coxhead Corp., 333 Sixth Ave., New York 14 N. Y.

Valves—Bulletin 44-7 shows hydraulic circuits and mounting dimensions of pilot valves. Vickers Inc., 1400 Oakman Blvd., Detroit 32, Mich.

Water-Treatment—Bulletin 451 describes packaged units for chemical treatment of boiler feedwater. Milton Roy Pumps, 1300 E. Mermaid Ave., Chestnut Hill, Philadelphia 18, Pa.

Welding—Bulletin 439 describes and gives procedures for various types of Lincolnwelds. The Lincoln Electric Co., Cleveland 1, Ohio.

TO THE EDITOR

Dear Sir:

I am calling to your attention the statement made in the second column of the first page of your section "Selection and Application of Twist Drills" reading as follows:

"History does not record the maker of the first milled flute twist drill, but credit for being the first to engage in its manufacture is usually given to Stephen A. Morse."

We must take exception to this

More answers to questions

ABOUT PLUNGE GRINDING AND CRUSH DRESSING

CAN ANY PLANT ADOPT CRUSH DRESSING?

Positively yes, regardless of whether the plant is small or large.

WHAT ABOUT SMALL PLANTS?

Production requirements may justify the purchase of Sheffield Precision Thread and Form Grinders, Micro-Form Grinders and other equipment offered by Sheffield. Or it is possible that production needs can be met with crusher rolls and mountings available from the Sheffield Corporation, Dayton 1, Ohio, for use on both surface and cylindrical grinders.

WHAT ABOUT LARGER PLANTS?

Many larger plants can use the entire line of Sheffield crush dressing equipment—Precision Thread and Form Grinder, Micro-Form Grinder and complete surface grinder equipment.

WHAT ABOUT CRUSHER ROLLS?

They can be obtained from The Sheffield Corporation. Crusher rolls for standard pitch threads are carried in stock—rolls for other pitches and all types of forms are available to specifications.

Crusher rolls for forms are made on the Sheffield Micro-Form Grinder and reproduced in quantity on the Sheffield Precision Thread and Form Grinder. Crusher rolls for threads are made originally and in quantity on the Precision Thread and Form Grinder.

WHO WILL HELP US APPLY THE PROCESS IN OUR PLANT?

Full knowledge of how crush dressing and plunge grinding are used abroad, plus a number of years' experience producing the equipment and applying the process in this country, are available to you from the staff of The Sheffield Corporation.

WHERE CAN WE SEE CRUSH DRESSING AND PLUNGE GRINDING IN ACTUAL OPERATION?

Sheffield not only builds Micro-Form Grinders and Precision Thread and Form Grinders, but also uses them in actual production of gages, instruments, machine tools, and in other close tolerance manufacturing work.

Visitors are always welcome at the Sheffield plants, Dayton, Ohio. If you can't come in person, write for Engineering Data.

The Sheffield Corporation

Dayton 1, Ohio, U. S. A.

350 SURFACE FEET PER MINUTE

TOUGH STEEL...TOOLS TAKE IT

SUNOCO EMULSIFYING CUTTING OIL

...removes 35 cu. in. of S. A. E. 1045 steel per minute

Cut deep . . . cut fast . . . cut long—that's the task for tools today, and throughout America production men are relying on Sunoco Emulsifying Cutting Oil.

In one operation, on an American Pacemaker Lathe, they were turning S. A. E. 1045 steel at 270 RPM and taking a cut ⅜" deep. The diameter of the piece being turned was 5"—350 surface feet per minute. In every minute, 35 cubic inches of tough steel were removed . . . but the tools "took the rap" thanks to Sunoco Emulsifying Cutting Oil.

Tool life increases when tools and work are flooded with Sunoco. The outstanding cooling and lubricating qualities of this cutting oil makes possible the prevention of overheating and drawing of the temper at the cutting edge and the reduction of "down time" for tool resharpening and resetting. Chips do not seize; the tools cut cleanly . . . evenly . . . at high surface speeds.

To speed production in your plant, get the details on Sunoco Emulsifying Cutting Oil . . . and to get worthwhile factual data on all types of machining operations, write for your copy of "Cutting and Grinding Facts" to . . .

SUN OIL COMPANY · ***Philadelphia 3, Pa.***

Sponsors of the Sunoco News Voice of the Air — Lowell Thomas

SUNOCO

SUN INDUSTRIAL PRODUCTS

OILS FOR AMERICAN INDUSTRY

statement as being erroneous as history does record this in the nature of a patent issued by the United States Patent Office and on file there as well as the patent granted to him which is on record in the files of this office, showing that a patent was granted to him for being the discoverer and originator of the first milled flute twist drill; and this company—the Morse Twist Drill & Machine Company—was organized and formed on the basis of that patent to manufacture and distribute such twist drills.

Yours very truly,

W. T. Read,
President & Treasurer
Morse Twist Drill & Machine Co.

NEW BOOKS

MACHINE DESIGN. THIRD EDITION—*By Carl L. Svensen, secretary, Texas State Board of Registration for Professional Engineers, 280 pages. Published by D. Van Nostrand Company, 250 4th Ave., New York, N. Y. $2.50*

This volume first published in 1921 for use with courses in mechanical drawing and machine design has been brought up-to-date. The text includes new material and a large number of new problems. The changes make the book of greater value for both teaching and reference purposes.

The author first considers the principles of mechanical drafting, including such standards as lettering, line work and methods of projection. He then takes up the subject of machine sketching, giving the reader some valuable hints as to methods of laying out work and of putting his ideas on paper. Machine details are then taken up with data as to their proper selection.

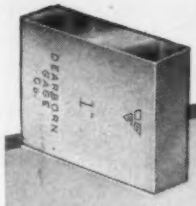
SEEN and HEARD

By JOHN R. GODFREY

Power of Jet Propelled Planes

WE ARE SO ACCUSTOMED to rate motors of all kinds in horsepower that we try to do the same with jet propulsion units on planes. But like a locomotive, it generates no power until it is in motion, and fast, so it is rated at 375 miles per hour.

When Watt built his steam en-



Send us your gage blocks for a complete measurement check

PROMPT RETURN

Take advantage of Dearborn Gage Company's complete inspection service for all types of gage blocks. Just send your gages to us and they will be inspected immediately and returned to you within 10 days from the time received by us.

Accurate calibrations are made (after the removal of high spots or burrs) in our temperature controlled inspection room, at 68 degrees Fahrenheit.

Where gage blocks are not badly worn and a more complete calibration is required, end and center measurements are made on rectangular type gage blocks and at the center of each side of square blocks.

CHARGES

2 types of inspection now available.

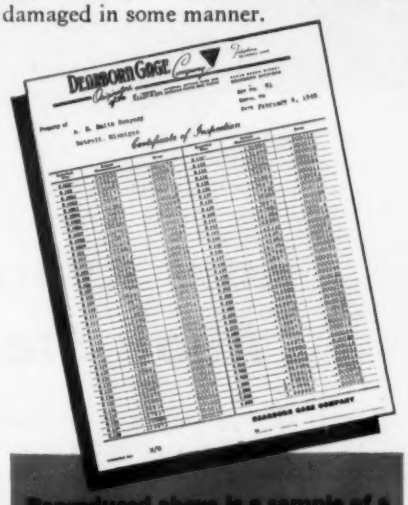
THE "W" (OR WORKING) CHECK:
Twenty five cents for each block smaller than one inch and twenty five cents for each additional inch or fraction thereof.

THE "I" (OR INSPECTION) CHECK:
Fifty cents for each block smaller than one inch.

Fifty cents per inch of block or fraction thereof of longer blocks.

REPLACEMENTS

When you send in your gage blocks for inspection it is very practical to give us specific instructions to replace any of your gages which we find to be worn beyond a certain tolerance. This specific tolerance is, of course, to be determined by you. You may also wish us to replace certain gages which have become damaged in some manner.

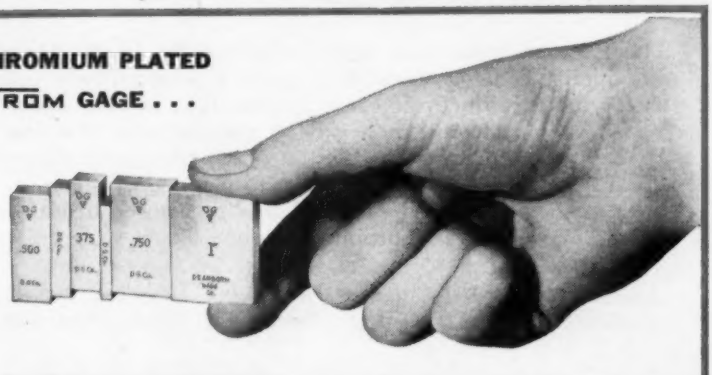


Reproduced above is a sample of a certificate of inspection, stating the specified size of each block measured and the actual measurement or variation from normal size.

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

THE CHROMIUM PLATED
ELLSTROM GAGE . . .



. . . ACCURATE TO ± .000002"

How Ryerson Assures Alloy Steel Quality

Each alloy shipment is personally inspected and tagged as a part of a rigid quality control system, which we call the Ryerson Certified Steel Plan. This plan covers: selection of the individual heats of alloy steel, the testing of samples from each heat, the positive identification of every alloy bar with stamped heat symbol and painted color marking (or with a metal tag), and a Ryerson Alloy Steel Report, which is sent with each shipment. This report shows complete test information for the particular heat of steel used in filling your order. It contains: chemical analysis, recommended working temperatures, the Jominy hardenability results, and an interpretation of physical properties for 1, 2, 3 and 4 inch rounds quenched and drawn at 1000°, 1100° and 1200° F. The report serves as positive identification, a check on quality and as a guide to satisfactory heat treatment.

The Ryerson Inspection Tag symbolizes the final culmination of our quality controls, because it places a personal responsibility on us for the fulfillment of every specification in your order. This is the Ryerson way of making sure that you get the right steel. Ryerson alloys all receive the same systematic care. Call Ryerson for alloy steels, or for any other type of steel, and be assured of uniform quality and prompt action.

RYERSON CERTIFIED STEELS

Joseph T. Ryerson & Son, Inc. Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

RYERSON STEEL-SERVICE

gines to replace horses for hoisting coal out of English mines, he had to have some unit that the mine owners would understand. So he made some tests with heavy dray horses and established the mechanical horsepower as 33,000 ft.-lb. per minute. This rating got the early builders of electric motors into plenty of trouble in trying to motorize street cars in various cities. They overlooked the fact that a horse can exert a lot of extra power when starting a car, and put on electric motors that were too small. A car that could be started by two horses took a 15- or 20-hp. electric motor, usually more, if it was to stand the gaff.

So with the jet units. They are rated by pounds of thrust at 375 miles per hour. Each pound of thrust at this speed is rated as equivalent to one horsepower of a conventional engine and propeller on an airplane. The effective power increases with the speed, up to a maximum of about 30 percent increase at top speed, presumably the speed of sound, or from 650 to 700 miles per hour. This shows that we must think in different terms when we get into new fields. It also shows that the sooner we realize that jet propulsion must be confined to airborne transportation, the better.

One Solution

A MEMBER of the Tennessee legislature recently introduced a bill that would bar lipstick from the state on the grounds that it is a cause of divorce. Men came home with telltale smears on their collars and cheeks, wives grew suspicious and angry. Result: a broken home.

Another good idea would be a bill to take all close limits off drawings and specifications. Inspectors would not be so exacting and there would not be so much spoiled work. Result: no more rejections.

European Engineers Foresee Postwar Trade Stimulants

THE SO-CALLED Morgenthau plan, which calls for the complete de-industrialization of Germany and the inflexible control of whatever manufacturing facilities remain, has won favor with engineers and industrialists of Continental nations. While many agree that the plan for complete de-industrialization will never

Check these Features of

VICKERS

Variable Delivery PISTON TYPE PUMPS

Among the features indicated below are many of the reasons for the high overall mechanical efficiency and the high volumetric efficiency of Vickers Variable Delivery Piston Type Pumps. Also, the inertia forces of the rotating parts are minimized . . . the cylinders are arranged axially permitting more compact design.

Write for new Bulletin 43-11 which includes description of construction, operation and types of controls, installation drawings, performance characteristics, installation and operating instructions of Vickers Variable Delivery Piston Type Pumps.

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Application Engineering Offices
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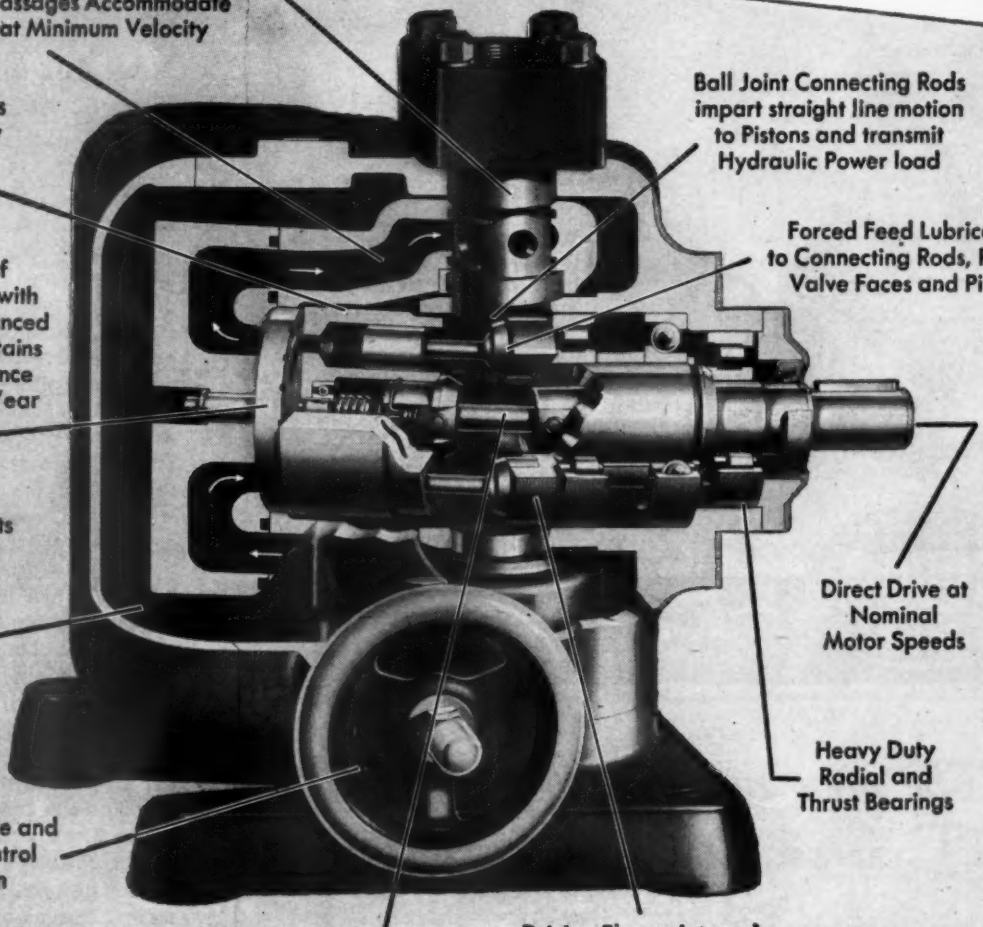
Hydraulically Balanced Pintles
Large Oil Passages Accommodate Oil Flow at Minimum Velocity
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Floating Universal Joint Shaft does not transmit Hydraulic Power load
Ball Joint Connecting Rods impart straight line motion to Pistons and transmit Hydraulic Power load
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Driving Flange Integral with Drive Shaft

There Are More Than 5,000 Standardized VICKERS Units For Every Hydraulic Power and Control Function

British Agents: STEIN & ATKINSON, LTD., LONDON

We don't want anyone to get the idea that Turner Gauges can be used only to speed up the manufacture of shells and other instruments of war. Yes, it's true, Turner Gauges are mighty important tools when you're thinking of winning a war, but when you start talking about washing machines and refrigerators and salesmen on every doorstep . . . well . . . Turner Gauges can help you. They'll speed up your production processes and guarantee a finer finished product. Write us. We've got good news for you.

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY
2623 HILTON ROAD • • FERNDALE 20 MICHIGAN

The men who make TURNER *gauges*

One reason why a Turner Gauge is a perfectly finished product is that the men who work here like to work here and are proud of a job well done.

be adopted, it is felt that certain German industries, particularly those essential to modern warfare, will be eliminated. Continental engineers and industrialists insist that the machine tool industry should be included.

Such nations as France and Czechoslovakia anticipate a demand upon them for machine tools and heavy engineering products. Many continental engineers believe that central European nations will become more and more industrialized. They point out that many intricate mechanical products can be made with unskilled workers operating machines properly designed and tooled. Thus farm workers will transfer to industry because of greater economic opportunities and improved living standards.

If the opinions of Continental industrialists hold true, industrialized nations abroad will probably find prosperity of unprecedented levels.

Modern Milling Practices

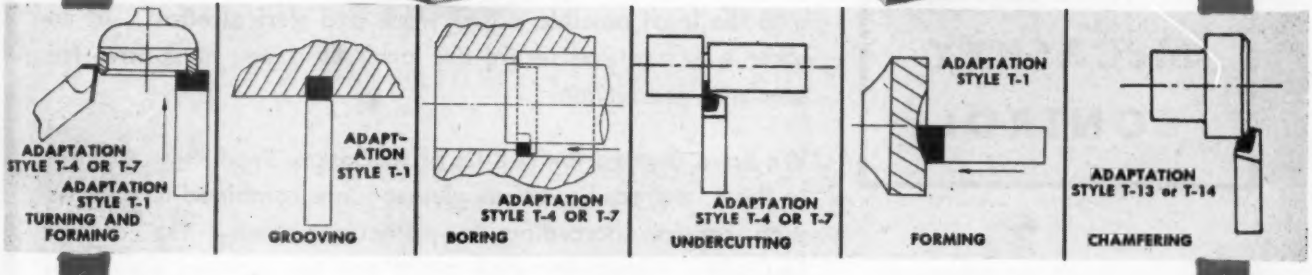
AS IN MOST CASES, overenthusiasm for new devices or practices, frequently boomerangs with discouraging results. High speed, or hypermilling, to use a fancy name, is no exception. While carbide cutters and negatives rakes have accomplished great results in many instances, there have also been disappointments when their selection was unwise. Some of our very practical production engineers contend that unless the work, the fixture and the machine can stand over 200 ft. cutting speed per minute, high-speed steels are more economical than carbides.

Similarly there are places where flywheels are much more advantageous than in others. There seems to be no doubt as to their advantage on old machines which are usually under-powered for modern cuts, speeds and feeds. Flywheels tend to smooth out the fluctuations caused by cutter tooth contact with the work and reduce the wear on bearings. They also tend to add to the life of cutters.

On newer machines, however, where the motors are often far in excess of the average power required, the flywheel is less effective. In fact some tests fail to show an appreciable difference.

Then too, we are likely to overlook the flywheel effect of the motor armature, especially on direct driven machines. Only a careful study of all conditions can secure best results.

How to Get 60% to 80%
OF YOUR CARBIDE TOOL NEEDS

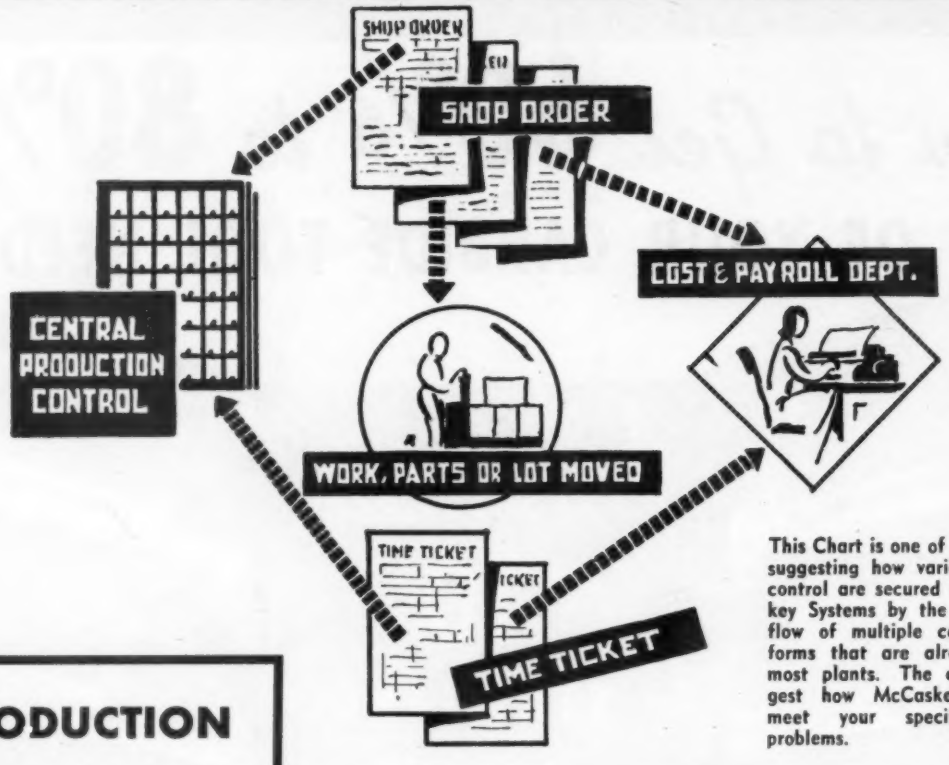


Standard Carboloy Tools are "master" styles carefully designed to meet most of your turning, facing, boring requirements. Widely used "as is", these standards may also be adapted to special requirements by quickly grinding to special shapes. A few of the many adaptations possible are shown in sketches above. With standards in your crib, you're prepared to "tool up" most jobs immediately without the necessity of stocking a large number of special tools.

For machining all metals and non-metallics, standard Carboloy Tools are priced as low as 70c each—actually lower than the price of ordinary tools in many sizes. Write for catalog GT-175R.

CARBOLOY COMPANY, INC. 11149 E. 8 MILE BLVD., DETROIT 32, MICHIGAN
Chicago • Cleveland • Houston • Los Angeles • Milwaukee • Newark • Philadelphia • Pittsburgh • Thomaston
Also Sold by Leading Mill Supply Distributors

Standard CARBOLOY TOOLS
TRADEMARK



This Chart is one of a series of eight suggesting how various elements of control are secured through McCaskey Systems by the visualizing and flow of multiple copies of a few forms that are already in use in most plants. The charts will suggest how McCaskey Control will meet your specific production problems.

PRODUCTION PROGRESS *VISUALIZED* THROUGH McCASKEY CONTROL

The right control system for *your* plant should provide what *you* need and what *you* want. No more, no less. And do it with the least possible paper work and clerical effort. In no other way can you secure the lower costs you must have for post-war production.

We have charted the A-B-Cs of McCaskey Production Control to show how easily various elements are combined to provide such control, according to particular needs. The correct McCaskey system for your plant can be outlined only with knowledge of your requirements. The charts, however, suggest how you can select and combine the elements of control that meet your needs.

A McCaskey industrial representative, qualified by training and experience, is available to help you analyze your requirements and suggest the McCaskey Control that will best meet them. No obligation, of course.

SEND AT ONCE FOR

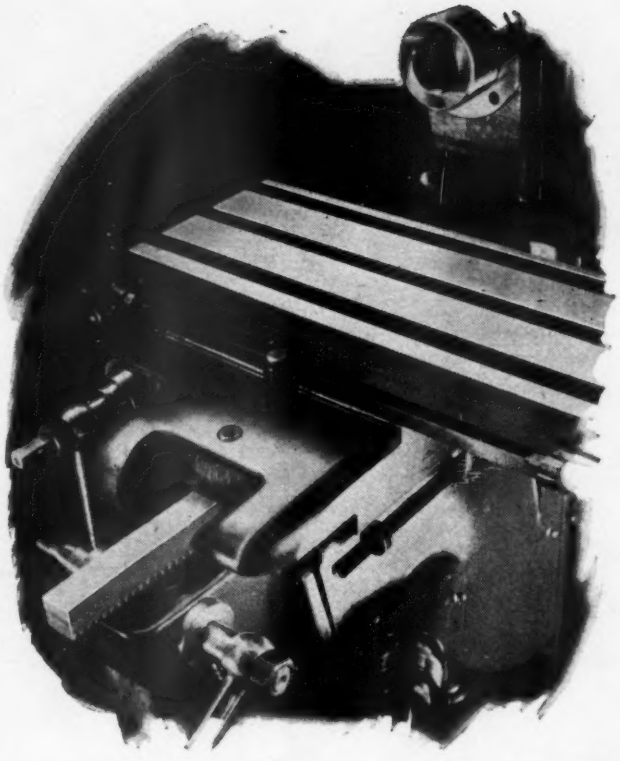
a copy of "The ABCs of Production Control" from which the above chart is reproduced and in which are covered a wide range of applications of control visualized simply and clearly to show how McCaskey Control operates. One of the systems shown or an adaption of it will fit your specific needs. *WRITE FOR YOUR COPY TODAY.*

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

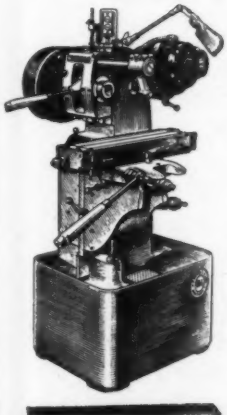
McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL



LATHE CARRIAGE FLEXIBILITY

KEEPS NICHOLS MILLERS BUSY



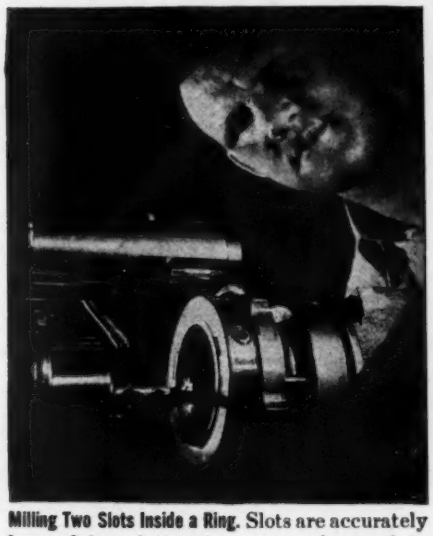
Precision turning, boring, recessing, jobs you'd normally assign to toolmaker's lathes or expensive boring machines, come natural to Nichols Millers.

Lever-Rack-and Pinion Transverse Feed is the answer. This exclusive Nichols development assures the *extra-utility* that makes the Nichols Miller *different* from conventional hand millers. It adds lathe-carriage flexibility to your most intricate machining operations while maintaining tolerances to "tenths." Work can be chucked lathe-fashion on the spindle with tools mounted on the table or vice versa.

Simple fixtures, made possible by the rise-and-fall spindle, reduce set-up time, even in the hands of semi-skilled operators on production lines, in toolrooms and laboratories.

Our new brochure will help you visualize how the Nichols Miller can fit your production scheme, now and for reconversion. Send for it today.

ALL NICHOLS MILLERS ALL DIFFERENT JOBS



Milling Two Slots Inside a Ring. Slots are accurately located in relation to one another and to drilled master holes.

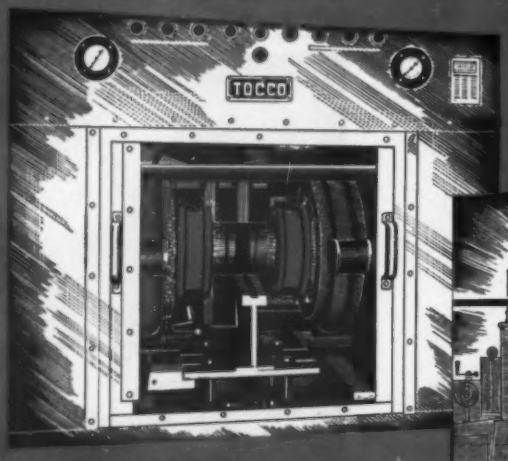
Precision Boring. Here the Nichols Miller with Rack and Pinion transverse feed is being used to bore a ±.0002" tolerance on a 3" diameter.

Reaming Two Holes to precise location within ±.0005". This job is done with two rack and pinion feeds and a quick-action work holder.

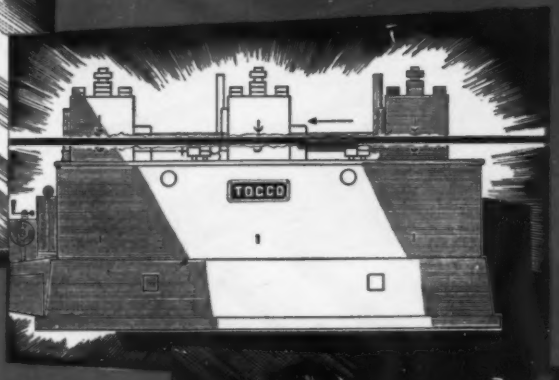
THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP. • 40 CHURCH ST., NEW YORK 7, N. Y. • *Dealers in all principal cities*



"JOB A." Tractor roller assembly. Harden rim surfaces and shrink-fit rollers on shaft simultaneously. Special TOCCO machine does this. Total heating time, 2½ min.



"JOB B." Bar stock, 1" diam., SAE 1045 steel. Heat treat uniformly to 30-31 R.C. Special TOCCO machine does this and produces straight, scale-free stock at 50% cost saving.

"JOB C." 272-lb. tractor gear. Harden and eliminate need for scarce alloys. Special TOCCO machine does this . . . permits use of plain carbon steel. Saves 144,000 lbs. nickel per year.

THE ANSWER TO *special problems* IN INDUCTION HEATING

PROBLEM: "My application is *special*. How can I get Induction Heating equipment to match my job *exactly?*"

ANSWER: Call in the TOCCO Engineer. He can give you an unbiased analysis of your problem and prescribe special equipment to match your job exactly because he is backed by:

The TOCCO Development Laboratory—largest of its kind in the world. Completely equipped and expertly staffed, this Laboratory finds the answer to hundreds of unique problems . . . and develops *special* TOCCO machines to match the job accurately (such as "A", "B", "C", above).

Remember, too, that the TOCCO Engineer can solve the "standard" problems quickly and accurately because he has available:

The world's most complete line of Induction Heating Equipment—standard TOCCO models, including motor-generator and electronic tube types of machines. One of these units with proper TOCCO fixture provides the correct answer for average applications.

Take advantage of these features of TOCCO Leadership to assure the fullest benefits from Induction Heating. The TOCCO Laboratory is described fully in the 20-page brochure, "Research for Results." Free on request.

THE OHIO CRANKSHAFT COMPANY • Cleveland 1, Ohio

TOCCO

INDUCTION

HARDENING, BRAZING

ANNEALING, HEATING

KEEPING PACE With The WORKHEAD

with its increased efficiency . . is a job worth the best that any small tool line can deliver.

Morse Tools have kept pace with industrial development for generations . . . supplying the necessary qualities to maintain high production.

MORSE

THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD, MASS., U. S. A.

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CM METEOR

Here is the Subtractor of Materials Handling Costs

Capacities from ½ ton and up. Lifting speeds from 18 to 60 feet per minute... Low headroom. Hook suspension, plain, geared or motor driven trolley.

CM Bulletin 142 illustrates and describes every operating feature that makes the CM Meteor Heavy Duty Electric Hoist an outstanding production time-saver... cutting deep into materials handling costs. Helical gears, aeroplane cooling, low headroom, safety limit brake, simplified maintenance... these and other advantages are explained in terms of operating efficiency and service life. Various types trolleys and accessory equipment, lift and speed tables, dimensions, etc., are included.

We invite you to write today.
Just ask for Bulletin 142.

CHISHOLM-MOORE
HOIST CORPORATION
(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y.

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TRADE MAXITORQ MARK

Floating Disc CLUTCHES

SINGLE OR DOUBLE

WET OR DRY TYPES

SO LONG LIVED

With parts so well designed, so accurately machined, so scientifically processed, there's little to wear in a Maxitorq Multiple Disc Clutch. Simplicity is the keynote . . . so much so that NO TOOLS are required for either assembly, adjustment or take-apart.

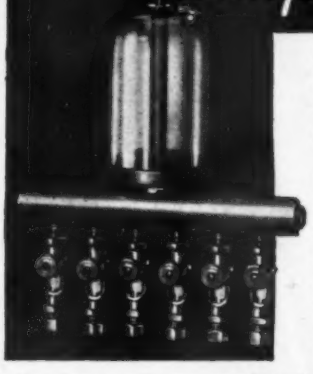
Several exclusive features prevent the past troubles of clutch operation . . . drag, abrasion and heating, for instance. Positive "in" and "out" is assured. Manual adjustment is easy and accurate. Quick disengagement is certain . . . engagement with light pressure control.

The Maxitorq will give long service without trouble, with minimum waste of power, with utmost efficiency of operation. Submit your clutch problems . . . ¼ to 5 H.P. at 100 R.P.M. . . . to our engineers for solution. Special sizes to order.

SEND FOR CATALOG NO. A52

THE CARLYLE JOHNSON MACHINE COMPANY · MANCHESTER, CONNECTICUT

MULTIPLE LUBRICATION *Simplified*



Here you have only one receptacle to watch and keep filled—a time saver and an assurance of dependable lubrication. Gits "MD" Sight Gravity Feed Multiple Oiler is a simple, practical and economical means of lubricating from 3 to 12 individual points from a central reservoir. Large capacity, transparent unbreakable plastic reservoir provides clear vision of oil contents at all times. A shut-off valve is located at the top of the transparent reservoir to prevent oil flow to the horizontal oil chamber when machines are not operating. Each drip fitting is equipped with an individual needle valve adjustment for regulating flow of oil, which can be locked against vibration. Ask for complete information on range of models and prices. Gits Catalog No. 60 illustrates and describes a full line of Oilers, Oil and Grease Seals and Lubricating Devices—write for your copy.

GITS BROS. MFG. CO.

1857 South Kilbourn Avenue, Chicago 23, Illinois

Exclusive for over 35 years

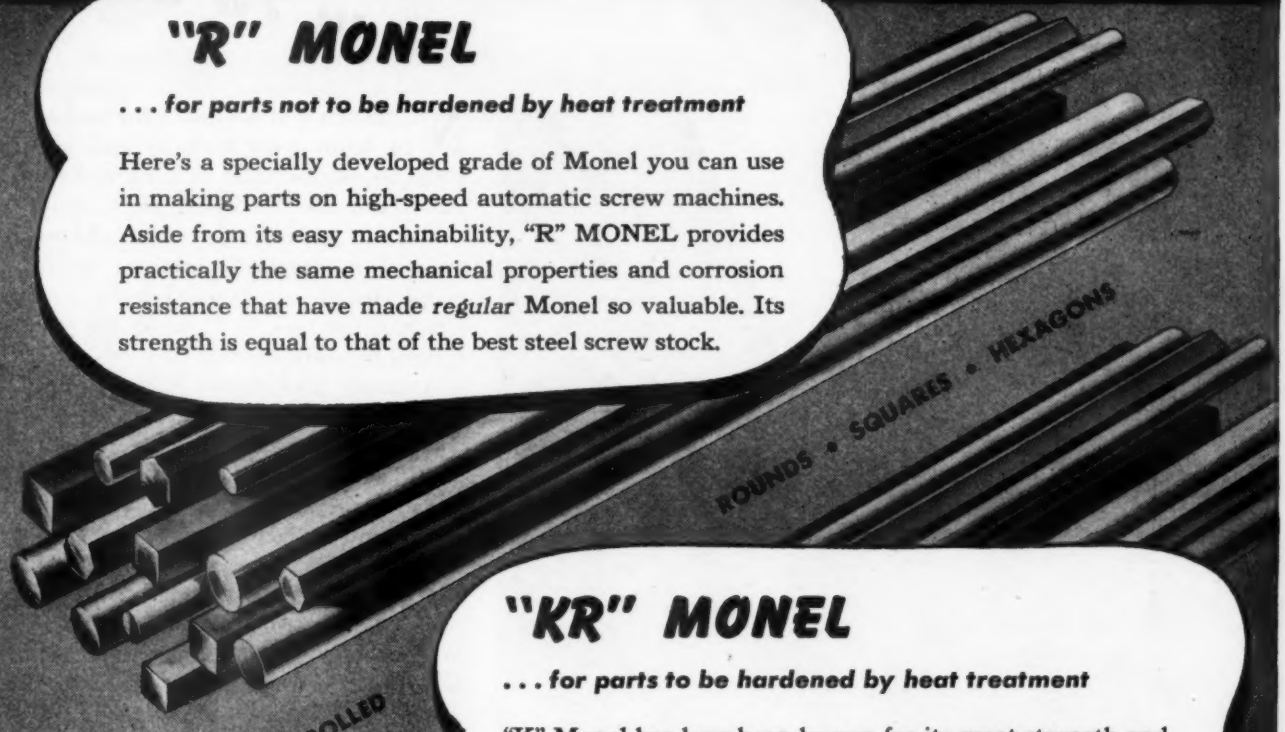
Two FREE-MACHINING MONELS

answer your need for strong, tough, rust-proof screw stock

"R" MONEL

. . . for parts not to be hardened by heat treatment

Here's a specially developed grade of Monel you can use in making parts on high-speed automatic screw machines. Aside from its easy machinability, "R" MONEL provides practically the same mechanical properties and corrosion resistance that have made *regular* Monel so valuable. Its strength is equal to that of the best steel screw stock.



"KR" MONEL

. . . for parts to be hardened by heat treatment

"K" Monel has long been known for its great strength and hardness. Now you have its *machinable* brother, "KR" MONEL, to use for screw machine parts that must be heat hardened to withstand heavy loads. Remember "KR" as your best bet for corrosion-resisting parts that must be made extra hard and strong through heat treatment.

FREE-MACHINING "R" AND "KR" MONELS CAN SAVE YOU TIME AND MONEY

MACHINING TECHNIQUES

for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, *"The Working of High-Nickel Alloys."*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.
Gentlemen: Please send me

☐ a copy of Machining Bulletin T-12
☐ a copy of "The Working of High-Nickel Alloys"

Name.....

Duties.....*Title*.....

A. M. 5-45

Company.....

Address.....

HOW TO RELOCATE AND FINISH GRIND HOLES TO .0001" IN 1/3 THE TIME

NO LONGER is it necessary for toolmakers to labor over buttons and locating plugs to correct holes in hardened parts... not if you use the Moore Jig Grinder.

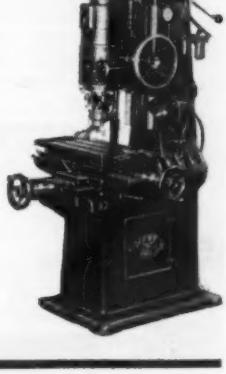
You can rely entirely on this unique machine to *mechanically* relocate and finish-grind straight or tapered holes to exact size and location in 1/3 to 1/4 the time required by conventional methods.

Accurate lead screws built into the Jig Grinder enable operators to guide the work rapidly to precise location within .0001" at the turn of the micrometer dials. This eliminates hours of checking on the bench and surface plate.

Working *to figures instead of to "fit,"* the Moore Jig Grinder takes die-making out of the "one-man" class and puts it on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die. Multi-section dies are quickly ground in *a single set-up*... eliminating separate-section hole grinding and the accompanying problems of accurately locating each section in the die bed.

MOORE SPECIAL TOOL CO., INC.
738 UNION AVENUE, BRIDGEPORT 7, CONN.

NEW 28-PAGE CATALOG describes Moore Jig Grinder's application to dies, drill jigs, gage parts, master plates and production parts.



MOORE MADE OUT OF TOOLS

Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

MACHINING DATA ON PLASTICS

5. FILING, SANDING & GRINDING

This is the fifth in the series of messages designed to better your knowledge about the machining of molded phenolics — the most versatile of all plastics . the type of plastics which Durez has specialized in producing during the past quarter century

In most instances, a Durez molded part comes from the mold with a high, smooth, lustrous surface which does not require additional finishing except for the flash line—or the parting line in split cavity molds. When the flash line is at the edge of the molded part, such as on bottle caps, a tumbling process is used. When the parting line is away from the edge and complete removal is desired, it is necessary to file, sand or grind the fins.

Filing

In hand or lathe filing, it has been found that bastard cut mill files are the most satisfactory for the removal of fins as well as for the life of the files. In practically all cases of machine filing, the file is held in the operator's hand permitting the use of most of the file surface at will and allowing the operator to give the file a certain twist or slide which is essential to correct filing. Recommended peripheral speed for machine filing is from 450 to 600 feet per minute.

Sanding

Most sanding operations are accomplished on disc wheels, endless flexible belts, and abrasive grinding wheels. This abrasive almost always consists of silicon carbide grains bonded with synthetic resin. Generally, for coarse sanding, Grade 90 is recommended. For fine sanding, especially when the surface must be reproduced by buffing, Grade 180 is recommended. However, in many cases it is necessary to use grades as fine as 240. Practically all sanding of phenolic materials is accomplished by the dry method. Recommended peripheral speeds for endless belts are 2500 feet per min., and for disc wheels up to 5000 feet per min.

Grinding

Grinding of phenolic molded parts is very rare. However, there are times when grinding is necessary especially on parts that might require an electrical contact by rotation or other means. In that case, the molded material and the metal insert are ground together. For example, National Grinding Wheel Co. recommends the following wheels and speeds for the various operations:

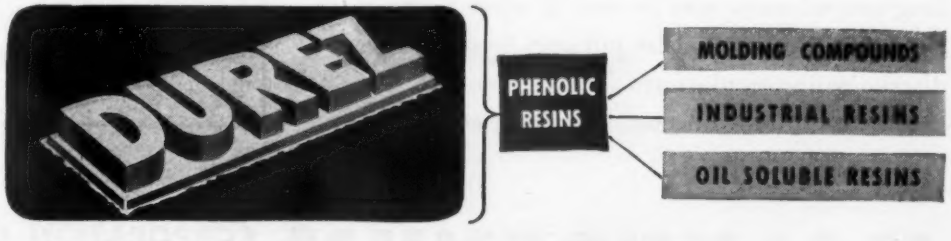
	Peripheral speed
Centerless grinding, rough operation C-36-K-10VM	5500 ft. per min.
Finishing C-60-J-10VM	5500 ft. per min.
Cylindrical grinding, rough C-36-K-10VM	5500 ft. per min.
Finishing C-60-J-10VM	5500 ft. per min.
Disc surface grinding C-36-I-10BB	5500 ft. per min.
Face surface grinding C-46-H-10VE	4500 ft. per min.

All of the above are silicon carbide vitrified wheels. Most satisfactory results are obtained by wet grinding.

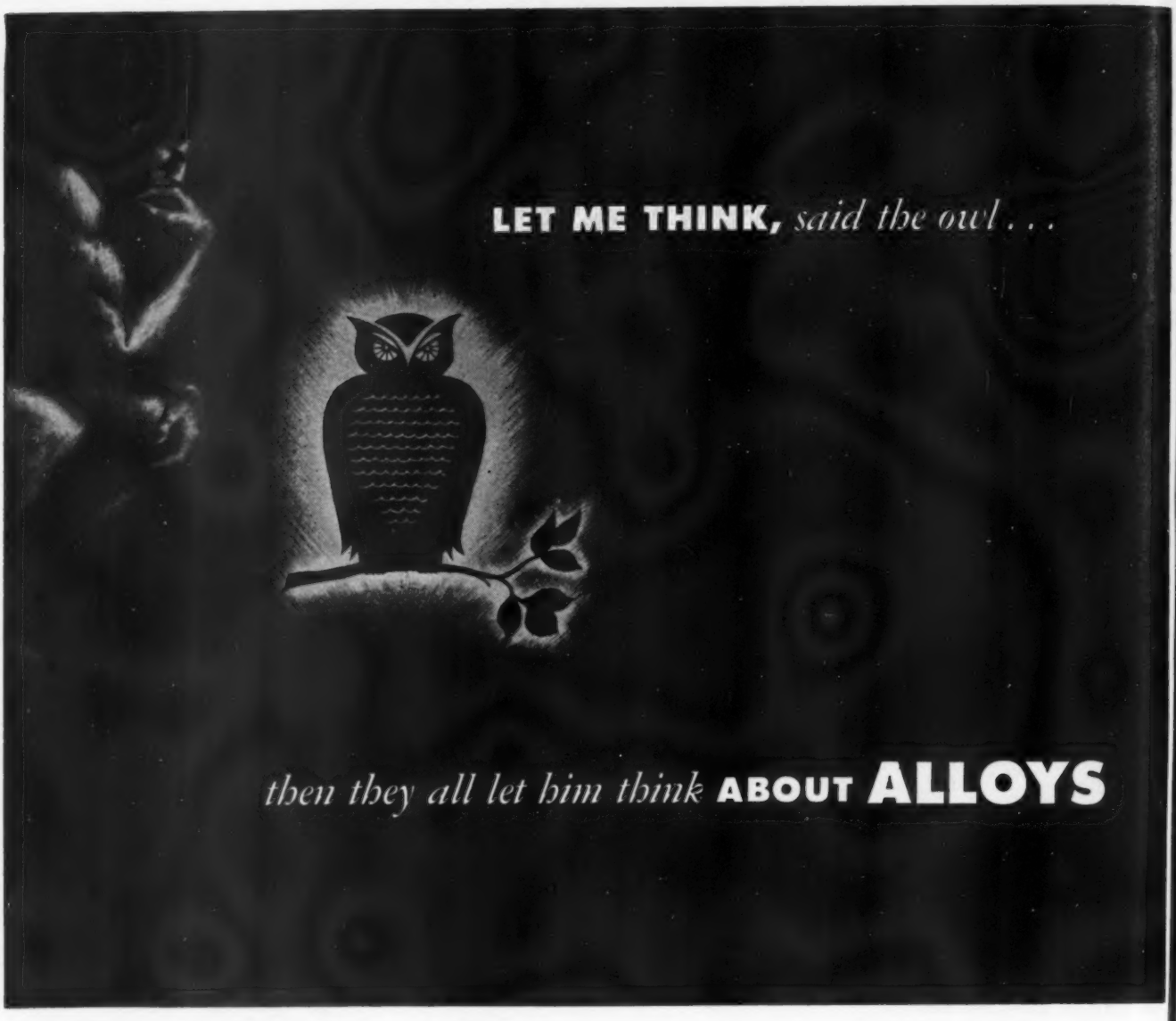
Cut-off operations,	Peripheral speed
dry method C-362-M-10BB	9500 ft. per min.
wet 80-472	9500 ft. per min.

Both of the above cut-off wheels are silicon carbide rubber-bound.

The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times toward furthering your progress in the machining of phenolic plastics. Durez Plastics & Chemicals, Inc., 535 Walck Road, North Tonawanda, N. Y.



PLASTICS THAT FIT THE JOB



Experience in wartime will have its values for the period to follow and all the newly developed possibilities of alloyed metals are not likely to be forgotten. When our swords are beaten into plowshares and our spears into pruning hooks, the same elements that gave matchless quality to war weapons will do likewise for the implements of peace.

It is only because they were indispensable for war that certain alloys have been withheld from civilian use and alternative materials have for the moment been made to serve. Each will find its own place before long and whatever may be said of other things it is clear that alloys will claim not only larger but more discriminating employment.

The uses of Molybdenum, Tungsten, and Boron in their various forms and combinations are described in the literature of the Molybdenum Corporation. Correspondence is invited.

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MOLYBDENUM **CORPORATION OF AMERICA**
GRANT BUILDING **PITTSBURGH, PA.**

MCA

SHAPING FILLETS on metal parts or patterns — getting in behind overhanging lugs or projections — deburring or countersinking holes in hard-to-get-at places (like the inside of a tube) . . . these indicate the versatility of the Nicholson Ball Shape Rotary File operated by portable tool or flexible shaft.

The Ball is one of 16 shapes Nicholson regards as standard for covering all practical machine-shop applications of rotary files. Each shape is offered in either Hand Cut or Ground type. The former, when no longer serviceable as such, can be converted into Ground type. The latter can be resharpened — usually a number of times — at slight loss of diameter.

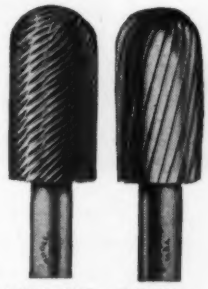
Hand Cut or Ground, each Nicholson Rotary File is accurately cut or ground from high-speed steel, true-centered, uniformly hardened — as sweepingly guaranteed for quality as the Nicholson hand files which are famed for their slogan, *"Twelve perfect files in every dozen."*

WRITE FOR CATALOG AND PRICE LIST — and for any help desired in the selection of *The right file for the job.* For ordering, contact your mill-supply house.

NICHOLSON FILE CO. • 97 ACORN STREET, PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

16 STANDARD SHAPES

(in either Hand Cut or Ground). 3 cuts—Coarse, Medium, Fine. 1/8" to 1 1/8" diameters.



HAND CUT GROUND

NICHOLSON ROTARY FILES

HAND CUT AND GROUND—FOR EVERY PURPOSE

NICHOLSON U.S.A.

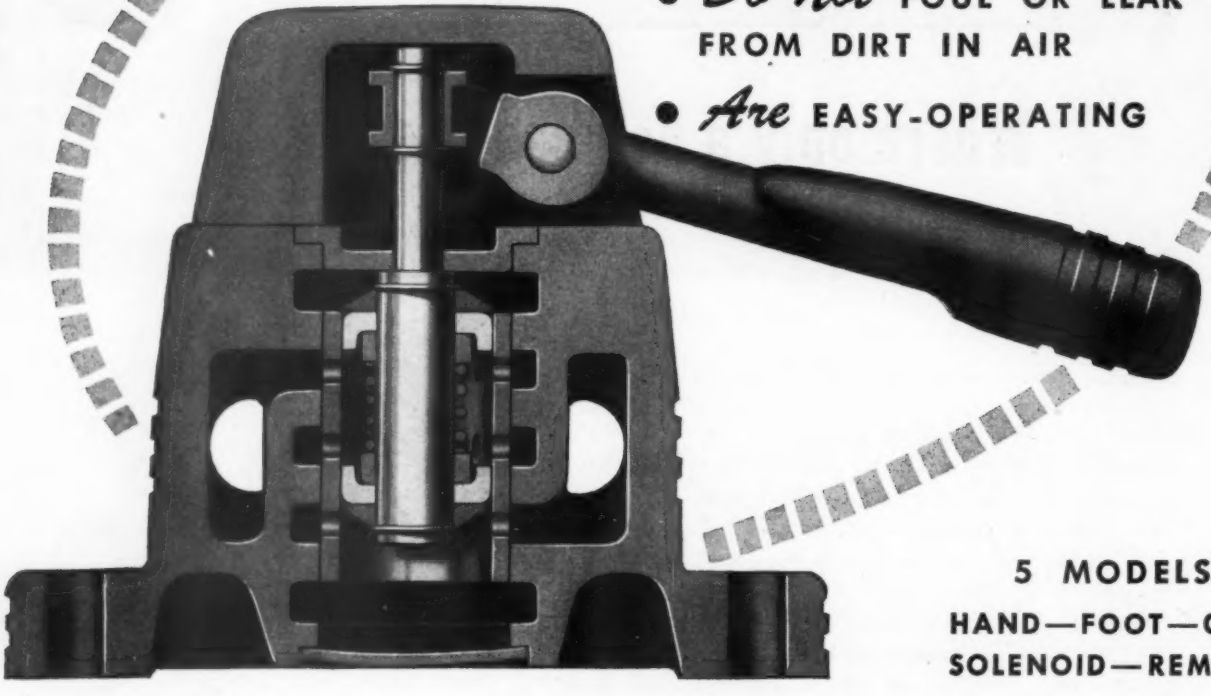
Yes, it's true!

GEROTOR *AIR* VALVES *have*

Model 2100
Air Control Valve

CUP-PACKING SEALS

- *Are* SELF-SEALING
- *Are* SELF-CLEANING
- *Do Not* FOUL OR LEAK FROM DIRT IN AIR
- *Are* EASY-OPERATING



Cross Section
View of Model 2100

5 MODELS
HAND—FOOT—CAM
SOLENOID—REMOTE

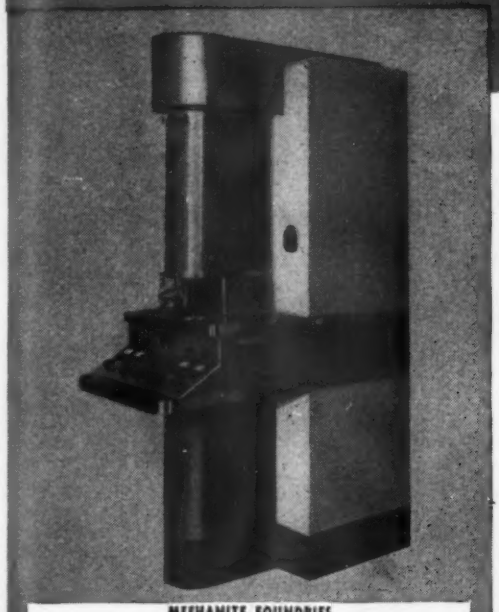
5 SIZES
¼" - ⅜" - ½" - ¾" - 1"

GEROTOR
AIR AND HYDRAULIC DEVICES

LOGANSPORT, INDIANA

GEROTOR MAY CORPORATION • PLANTS—BALTIMORE, MARYLAND • LOGANSPORT, INDIANA

RCA Electron Microscope



MEEHANITE FOUNDRIES

Allentown, Pa.	Traylor Engineering & Mfg. Co.
Ansonia, Conn.	Farrel-Birmingham Co., Inc.
Birmingham, Ala.	The Continental Gin Co.
Bridgewater, Mass.	The Henry Perkins Co.
Brooklyn, New York	E. W. Bliss Company
Buffalo, N. Y.	Pohlman Foundry Co., Inc.
Charleston, W. Va.	Kanawha Manufacturing Co.
Chattanooga, Tenn.	Ross-Meehan Foundries
Chicago, Ill.	Groenlee Foundry Company
Cincinnati, Ohio	Cincinnati Grinders Incorporated
Cincinnati, Ohio	The Cincinnati Milling Machine Co.
Cleveland, Ohio	Fulton Foundry & Machine Co.
Denver, Colo.	The Stearns-Roger Mfg. Co.
Detroit, Mich.	Atlas Foundry Co.
Flint, Mich.	General Foundry & Mfg. Co.
Hamilton, Ohio	The Hamilton Foundry & Machine Co.
Hamilton, Ontario	Otis-Fensom Elevator Co., Ltd.
Irvington, N. J.	Barnett Foundry & Machine Co.
Jeannette, Pa.	Elliott Company
Los Angeles, Calif.	Kinney Iron Works
Milwaukee, Wis.	Koehring Company
Mt. Vernon, O., Grove City, Pa.	Cooper-Bessemer Corporation
Newark, N. J., Peoria, Ill.	M. H. Detrick Co.
New York, N. Y., Mahwah, N. J.	The American Brake Shoe Co.
Oakland, Calif.	Vulcan Foundry Company
Orillia, Ontario	E. Long, Ltd.
Philadelphia, Pa.	H. W. Butterworth & Sons Co.
Philadelphia, Pa.	Florence Pipe Foundry & Machine Co. (H. D. Wood Company, Selling Agents)
Phillipsburg, N. J.	Warren Foundry & Pipe Corp.
Pittsburgh, Pa.	Rossdale Foundry & Machine Co.
Portland, Oregon	Crawford & Doherty Foundry Co.
Rochester, N. Y.	American Laundry Machinery Co.
St. Louis, Mo.	Banner Iron Works
St. Paul, Minn.	Valley Iron Works
Seattle, Washington	Washington Iron Works
Spokane, Washington	Washington Machinery & Supply Co.

A NEW DESIGN,

A new product demands the "BUILT-IN" quality of

MEEHANITE Castings

Recently introduced by the Radio Corporation of America, this improved Electron Microscope is fifty to one hundred times more powerful than the best light microscope. Micrographs taken with it can be enlarged to a useful magnification of as much as 100,000 diameters.

Truly a precision instrument, its design and construction call for the better engineering properties provided by Meehanite Castings. In the RCA Electron Microscope the following are Meehanite Castings:

1. **Valve Block Gear Frame** 2. **Valve Block**
3. **Viewing Chamber**

The rigid control of the manufacturing and metallurgical processes used in the production of Meehanite Castings provide freedom from internal stresses and increased dimensional stability. The finished castings shown reveal the need for uniform density, solidity, lack of porosity to assure good vacuum and ready machinability, contributing to manufacturing efficiency and "built-in" quality.

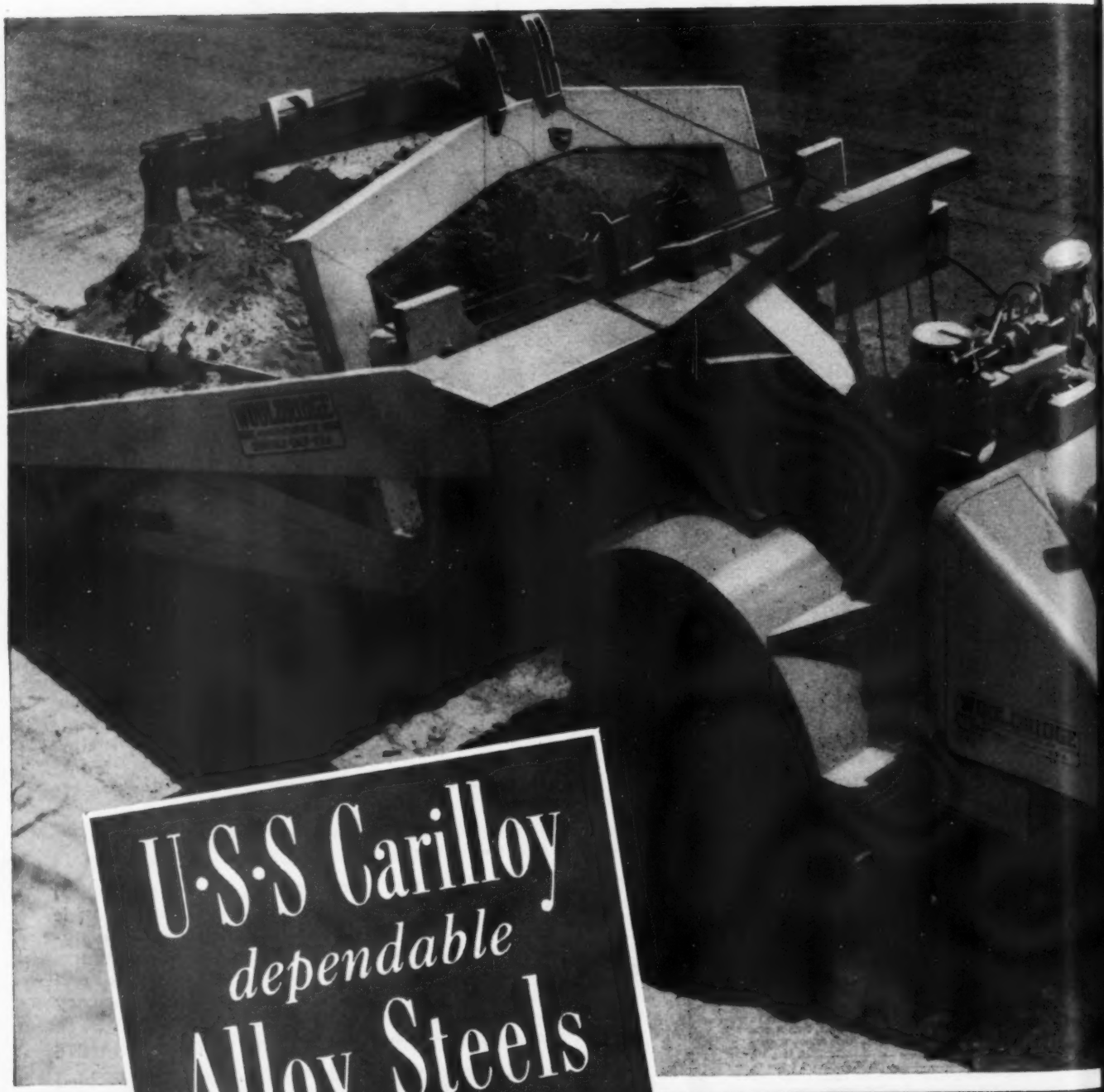
IN NEW PRODUCT DESIGN THE TREND IS TO MEEHANITE

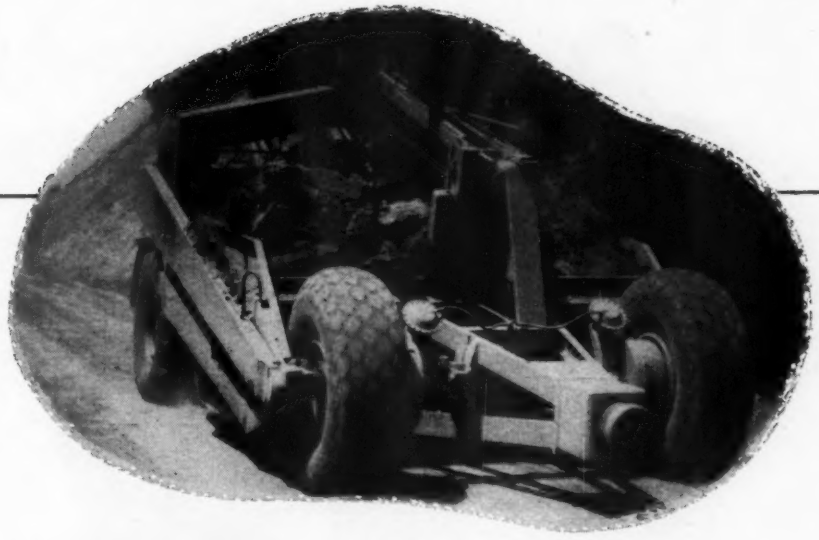
Write for our Bulletin No. 19, "Meehanite Castings vs. Welded Construction."

MEEHANITE RESEARCH INSTITUTE

NEW ROCHELLE, N. Y.

Engineered for performance





VITAL PARTS THAT MUST STAND THE MOST GRIEF ARE MADE OF SPECIAL PURPOSE U·S·S CARILLOY ALLOY STEELS

CAPABLE of carrying full capacity loads of 18 cu. yds. at speeds up to 20 m.p.h., this recently developed, self-propelled, heavy duty scraper has been built to meet tomorrow's high-speed, low-cost earth-moving requirements.

Every part has been designed for maximum efficiency and for lowest cost performance.

For that reason, axles are made of U·S·S Carilloy Alloy Heat-treated Steel, side rail scrapers are of special U·S·S Abrasion Resisting Steel.

• • •

Wherever it is necessary to insure strength and safety, to provide superior resistance to shock and impact, to decrease weight, conserve space or to reduce maintenance, U·S·S Carilloy Alloy Steels are available to facilitate sound, economic engineering design.

U·S·S Carilloy Alloy Steels include Bearing Steels, Aircraft and Gun Quality Steels, Heat Resisting Steels, AISI, NE and Special Analysis Steels, as well as Nitralloy Steels, in all grades, in all finishes and in the widest range of sizes—produced either by Electric Furnace or Open-Hearth process.

Our unsurpassed facilities for on-the-spot rolling, finishing and heat treating permit us to furnish alloy blooms, billets and bars, slabs, plates, sheet and strip, as well as standard and special sections. Wide flexibility in furnace capacity makes it possible to handle, promptly, small orders as well as large.

U·S·S Carilloy Alloy Steels are produced by specialists who make fine alloy steels and nothing else—and whose aim is to give you the exact grade of steel that will do the best job for you at lowest cost. We welcome the opportunity to work with you.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS STEEL — UNITED STATES STEEL

STATES STEEL

PURCHASING AGENT: *"How's Titeflex working out, Fred?"*

PLANT SUP'T.: *"Swell!..it's cut tubing replacements in half!"*

It's production Fred's thinking about when he okays Titeflex. In Titeflex he has found a flexible tubing that stays on the job longer—that helps keep output up, that reduces shut-downs and delays.

All through industry, the more vital the need for a *better* flexible tubing the more certain you are to find Titeflex. You'll find it where conditions demand great flexibility to withstand severe vibration . . . where high temperatures or corrosion are factors . . . where unusual pressures or exceptional abrasion quickly cause failure in ordinary flexible tubing.

Being *all metal*, Titeflex won't deteriorate in use. Having *four* thicknesses of metal at the point of greatest wear instead of one, Titeflex is naturally stronger and more durable. Having its metal braiding woven on as it's made, Titeflex has better protection against high pressures or elongation.

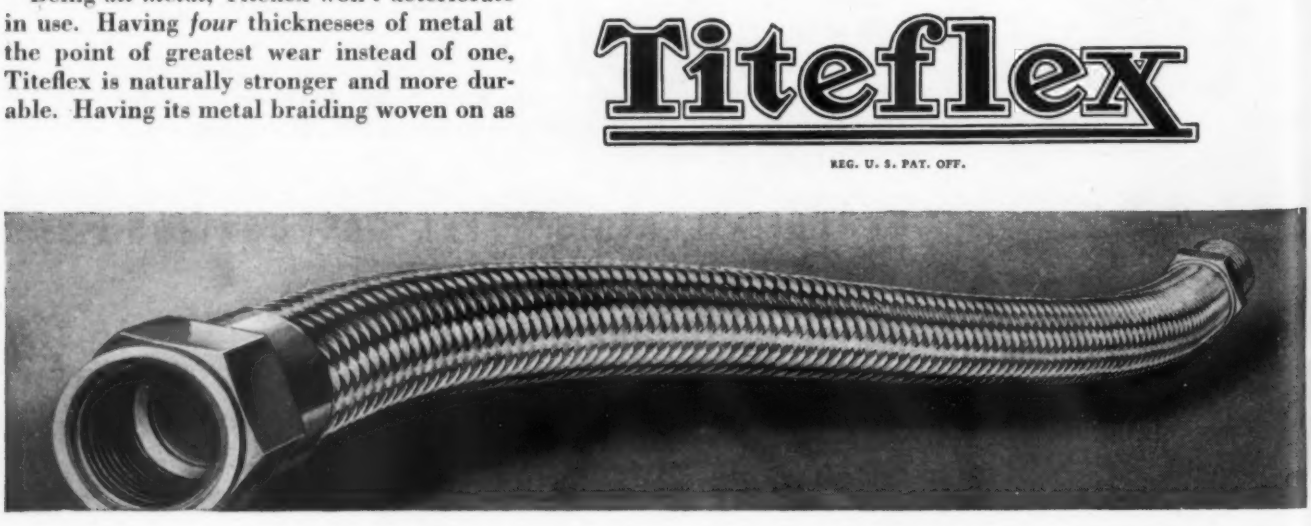
Many sizes and types of Titeflex flexible all-metal tubing are available to meet most industrial requirements. Let us send you catalog No. 113 with information and data useful both in present operations and in post-war planning. Mail your request today.

TITEFLEX, INCORPORATED
535 Frelinghuysen Avenue
Newark 5, N. J.

ARMY E NAVY

Titeflex

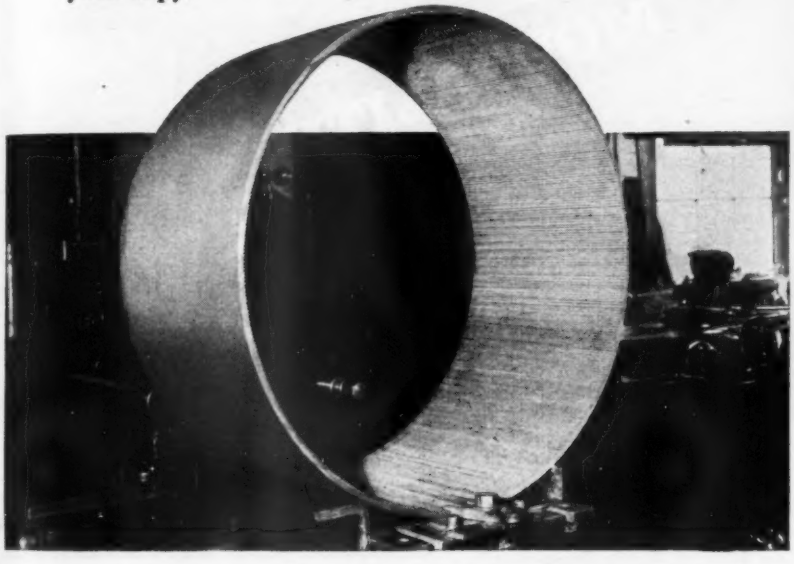
REG. U. S. PAT. OFF.



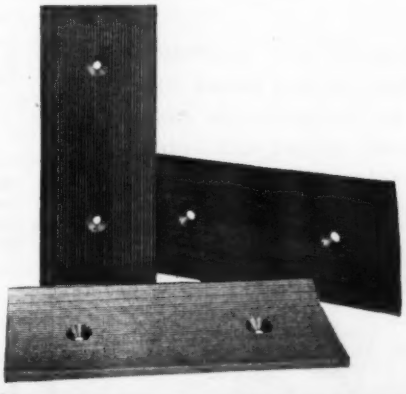
Users Continue Praise for SPEED TREAT *and* SPEED CASE *Plate*

New materials and methods of merit take hold fast in America. That's why more and more manufacturers are adopting *Speed Case*, a low carbon, open hearth, free machining steel (X1515) and *Speed Treat*, a medium carbon, open hearth, free machining steel (X1545).

Both offer the advantages of easy cutting with resultant lower tool costs, better finish more readily obtained, fast and uniform response to heat treatment and desirable qualities through heat treatment, such as stress-resistance and surface hardness. Catalog 1243 details numerous case studies — send for your copy.



The F. H. Ayer Mfg. Co., Chicago Heights, Ill., cut machining costs 52%, in addition to lowering tool costs and reducing material costs, by using *Speed Treat for hammermill plates.* A *Speed Treat* plate 8′ x 18″ x 1⅛″ was rolled into a cylinder, welded and machined. Inner corrugations were machined in 22 hours. Outside was machined in 40 hours. Cylinder was then cut into plates, as shown at right, which were drilled and counterbored. In heat treating, plates were quenched in water from 1575° F. and drawn at 500° F.; a hardness of 45 on the Rockwell "C" scale resulting. This is a typical user report of saving with *Speed Case* and *Speed Treat* plate.



Now Available At These 12 Dependable Sources:

The Burger Iron Co.
AKRON, OHIO

Brown-Wales Co.
493 C St.
BOSTON, MASS.

Beals, McCarthy & Rogers, Inc.
BUFFALO, N. Y.

Peninsular Steel Co.
1030-40 McDougall Ave.
DETROIT, MICH.

W. J. Holliday & Company
HAMMOND, INDIANA

Earle M. Jorgenson Co.
5311 Clinton Drive
HOUSTON, TEXAS

W. J. Holliday & Company
INDIANAPOLIS, IND.

Earle M. Jorgenson Co.
10510 So. Alameda St.
LOS ANGELES, CALIF.

Grammer,
Dempsey & Hudson, Inc.
NEWARK, N. J.

Earle M. Jorgenson Co.
1657 22nd St.
OAKLAND, CALIF.

Horace T. Potts Co.
East Erie Ave. and "D" St.
PHILADELPHIA, PA.

Peckover's Limited
77 Front St. E.
TORONTO, ONT., CANADA

W. J. HOLLIDAY & CO.

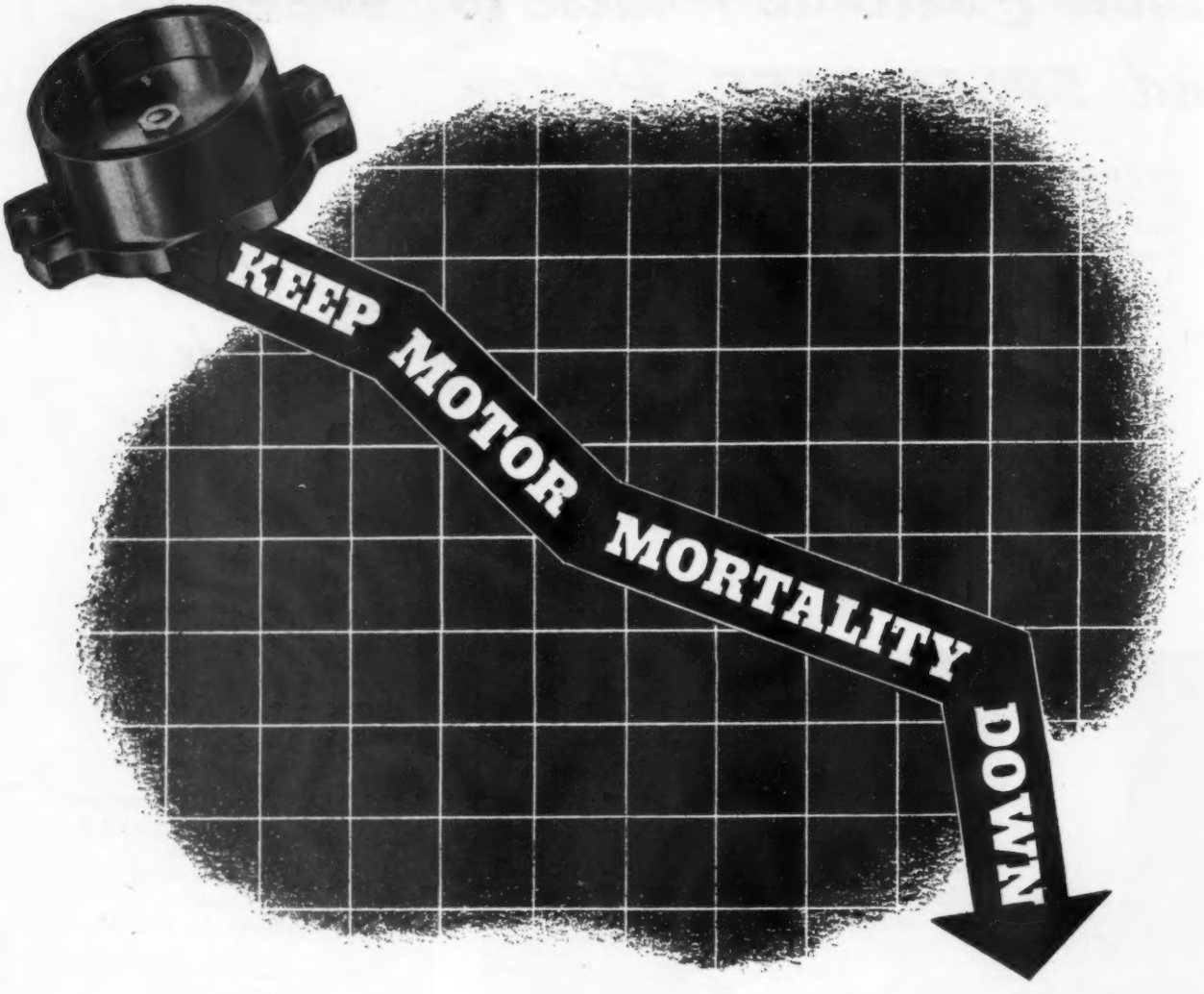
89 Years of Progress

***Speed Case*—*Speed Treat* Plate Division**

HAMMOND, INDIANA

Established 1856

Klixon Motor Protectors



When you buy motors with built-in Klixon Protectors you can be sure that you'll get full motor life. And in all probability these Klixon Protected motors will outlast the equipment in which they are used.

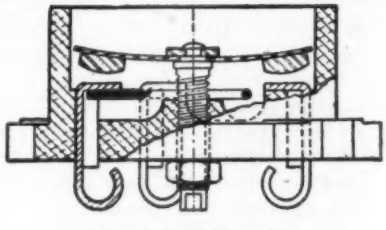
Built into the motor by the motor manufacturer, Klixon protectors are matched to the motor, thus assuring a proven and tested combination of a properly rated protector fitted to the particular motor. To the user, it means that the protector will permit maximum safe operating capacity yet provides complete motor safety by preventing motor overheating and burnouts.

Reduce your motor mortality rate to practically zero, always buy motors with built-in Klixon Protectors (in automatic or manual reset types) for A. C. motors all sizes; D. C. motors up to 30 volts.

KLIXON MOTOR PROTECTORS

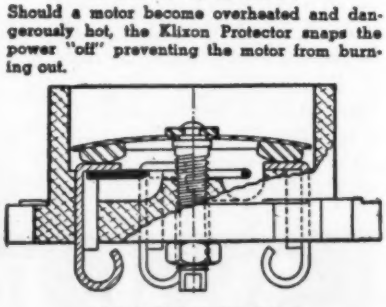
SPENCER THERMOSTAT CO., ATTLEBORO, MASSACHUSETTS

Here's how it works



CLICK! IT'S OFF!

Should a motor become overheated and dangerously hot, the Klixon Protector snaps the power "off" preventing the motor from burning out.

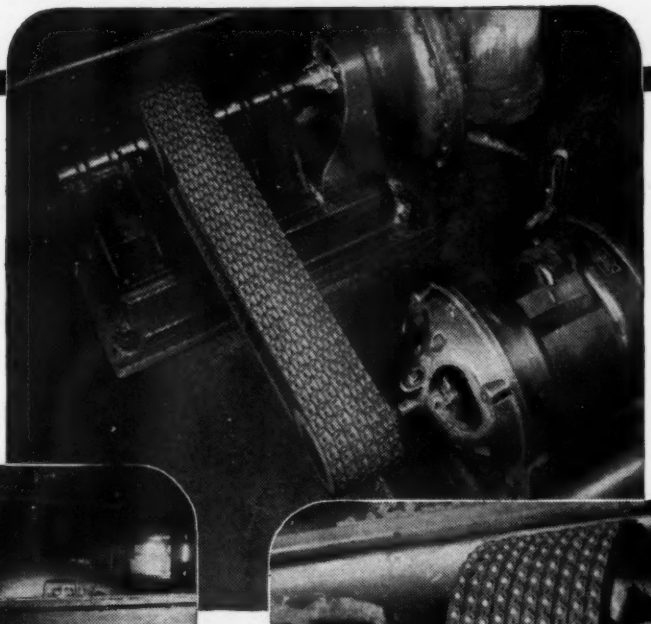


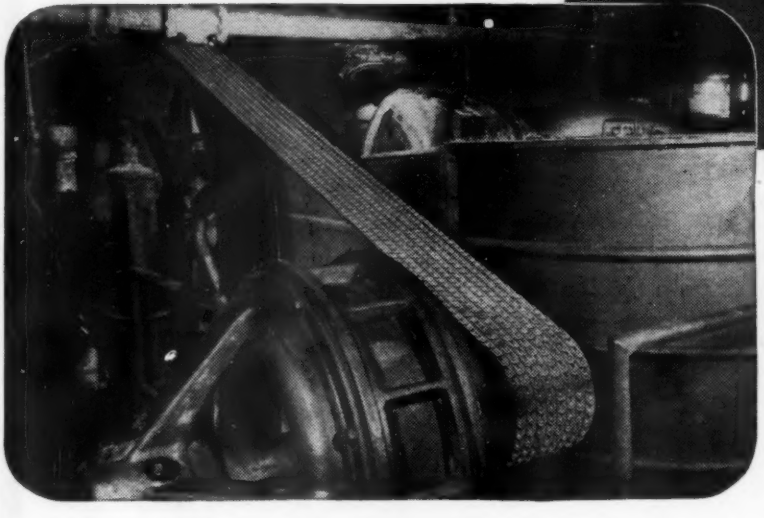
CLICK! IT'S ON!

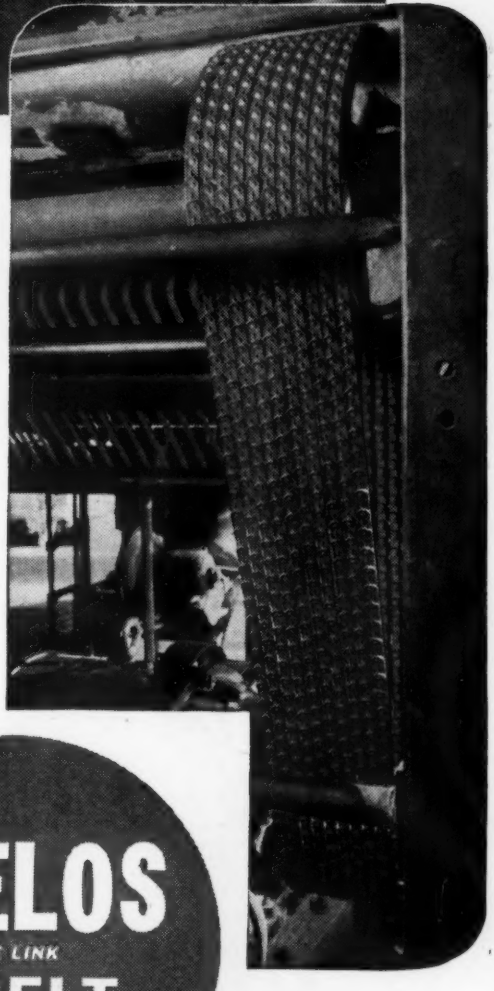
When the motor cools to safety, the Klixon Protector snaps the power "on" automatically if the automatic reset is specified . . . or when the reset button is pushed when manual type is specified.

"Easier to Install"

. . . SAYS PLANT ENGINEER ABOUT VEELOS







ON drive after drive in a big Eastern manufacturing plant . . . over a wide range of equipment . . . under a variety of service conditions . . . you'll find the belt used is Veelos. And Veelos, the adjustable, link V-belt, drives all of this equipment with maximum efficiency.

When asked *"Why Veelos?"*, the plant engineer replied, *"It's easier to install."* He was talking straight to the point! Easier installation is one of the big advantages provided by Veelos link construction. Among the others are:

1. Adjustability to End Slippage: Veelos link construction provides quick, easy tension adjustment to end slippage.

2. Controlled Tension Protects Bearings and Belts: Control of tension on each individual strand permits uniform, controlled tension in the entire drive. This protects bearings as well as belts.

Learn How Link Construction Ups Production

Write today for free 8-page illustrated manual giving Veelos applications, construction detail, installation directions and engineering data.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

VEELOS
THE LINK
V-BELT
Adjustable to any Length
Adaptable to any Drive

Here's how Apex helps users of Phillips Screws!

APEX bit holders revolutionize the use of Power Bits and Hand Drivers for Phillips Recessed Head Screws. Here's what they do:

One Save you money after original installation of holders is made because they eliminate necessity of carrying so many different sizes of screw driver bits. Only items necessary to carry in stock are the insert tips. One range of inserts fits various sizes of holders.

Two Save vitally needed critical steel and release it for other war time needs.

Three Increase bit life due to the float between insert and holder, allowing for easier alignment with recess in screw.

Four Decrease handling cost of screw driver bits because it is no longer necessary to return screw drivers for reconditioning as cost of inserts is approximately that of the reconditioning charge.

Send for Bulletin No. 102 giving complete details.

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON 2, OHIO

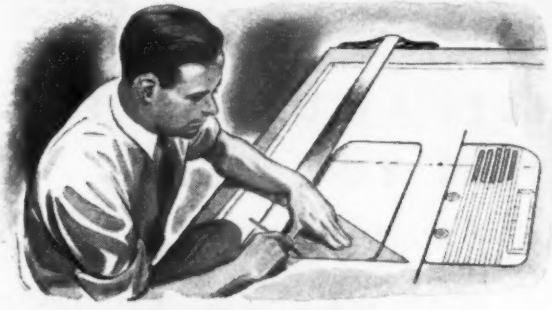
Manufacturers of Power Bits for Phillips, Slotted Head and Clutch Head Screws; and Hand Tools for Phillips and Clutch Head Screws.

OUT GOES SPOILAGE!

Hamstrung by work-spoiling driver skids while he used slotted screws, a certain radio cabinet manufacturer made a complete switch-over to Phillips Recessed Head Screws. Result: production shot up like a rocket!

DOWN GO COSTS!

With this upward swing in production, there was a consequent *downward* swing in costs. A downswing that was helped along plenty by the fact that Phillips Screws drive up to 50 percent faster!



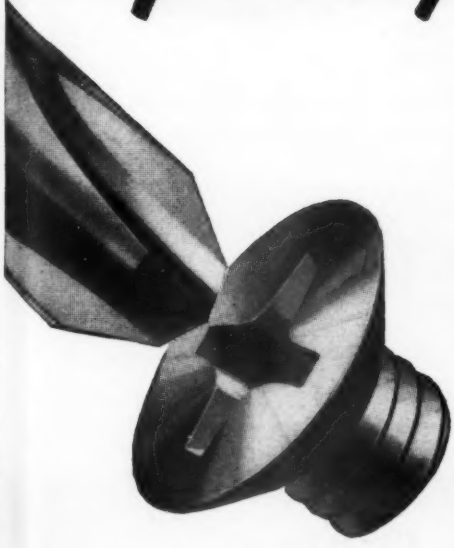
UP GOES STRENGTH!

On production . . . on costs . . . yes, also on design, . . . use of Phillips Screws makes a big difference. Engineered for heaviest driving pressures, they help designers plan exceptional strength and rigidity into products!

AWAY GOES SALES RESISTANCE!

Saleswise, too, use of Phillips Screws pays off. They not only add to a product's strength, smartness, and general good looks. They also banish burrs that snag clothes and sidetrack sales!

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

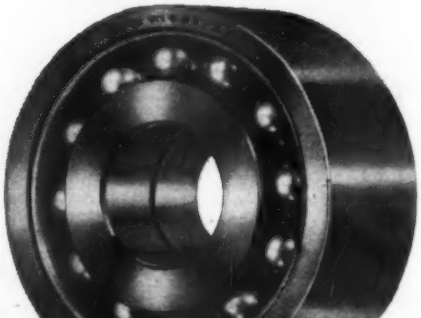
Made in all sizes, types and head styles

25 SOURCES

American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

GREATER ECONOMIES AND BETTER PERFORMANCE WHEN YOU USE

SCHATZ "Commercial" BALL BEARINGS



The low cost of Schatz "Commercial" Ball Bearings opens up new horizons for manufacturers who use ball bearings in their product.

There is a "Commercial" ball bearing for every industrial need — standard types, or bearings made to your specifications.

If you are now planning future production, keep Schatz "Commercial" ball bearings in mind. They are *good* ball bearings — tough, durable, efficient, used by manufacturers for over 30 years.

Schatz engineers will gladly assist in solving your ball bearing problems.

THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

Don't get caught Napping

while "Fastening Bugs" creep into your post-war product plans

The time to decide on fastenings for your post-war product is *now* – while it is still in the design stage. Too many products are all tooled up and in production before "fastening bugs" are discovered. Why wait to change *later*? Why sacrifice the savings you could be making from the start?

You will want to use P-K Self-tapping Screws wherever possible, because this *short cut fastening method* can save you from 30% to 50% in assembly time and labor. Experience proves you can save time – speed assembly – cut costs – reduce rejects – in 7 out of 10 cases.

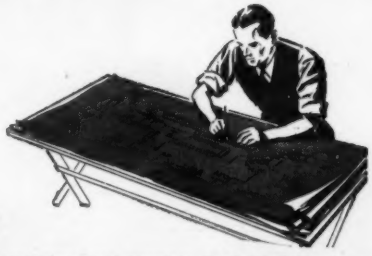
• • •

Sperry Products, Inc., eliminates tapping with the "Short-cut" Fastening Method

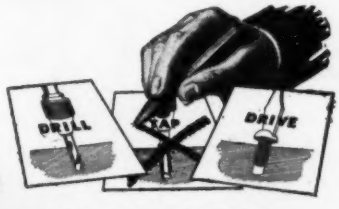
Eight P-K Type "F" Screws fasten a metal gasket retainer and gasket to an aluminum transmitter cover used on a Hydraulic Control mechanism.

"Tapping these parts would tie up equipment in our machine shop badly needed for other important operations, and seriously delay production," says a Sperry Engineer. Why not make sure of similar savings on your assemblies . . . clear out any needless tapping "bugs" hiding in your plans – *now*!

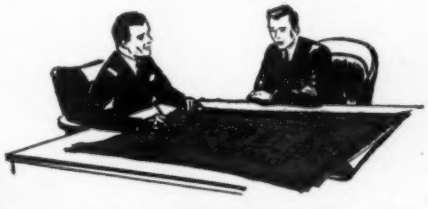
HERE'S HOW TO START ASSEMBLY SAVINGS WHEN YOU START PRODUCTION



1. *QUESTION EVERY FASTENING* in your plans. Ask – "Can it be done the simpler way – with P-K Self-tapping Screws?" – before you O.K. more complicated methods.



2. *ELIMINATE NEEDLESS TAPPING,* awkward bolting, riveting in hard-to-reach places by specifying one of the several types of P-K Self-tapping Screws designed for all metal and plastics assemblies.



3. *ASK A P-K ASSEMBLY ENGINEER* to go over your plans with you – to make sure you find all the "bugs". You'll find his advice unbiased, because Parker-Kalon makes all types of Self-tapping Screws. Or, send assembly details for recommendations. Parker-Kalon Corporation, 208 Varick St., New York 14, N. Y.

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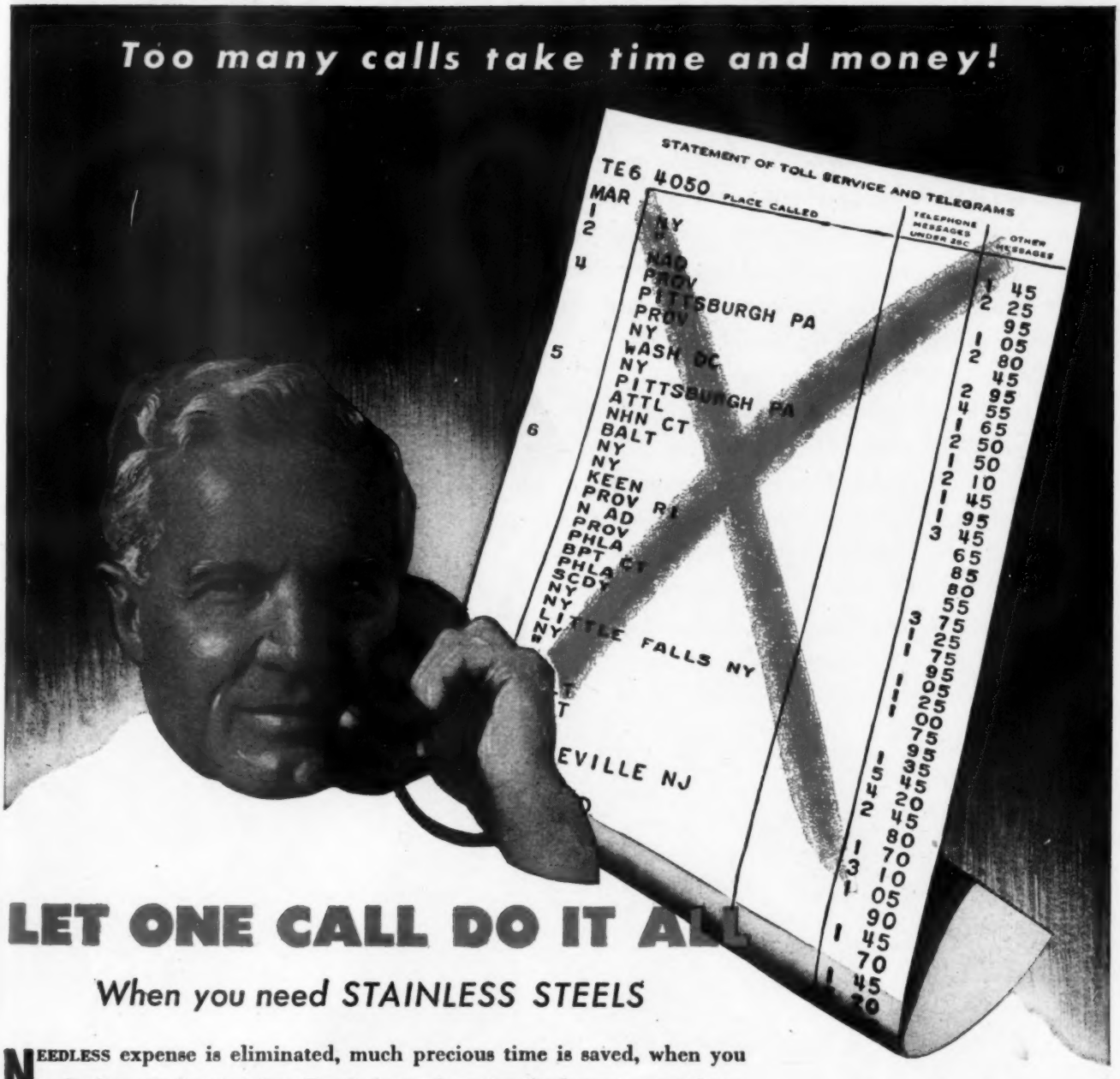

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and complete interchangeability of component parts

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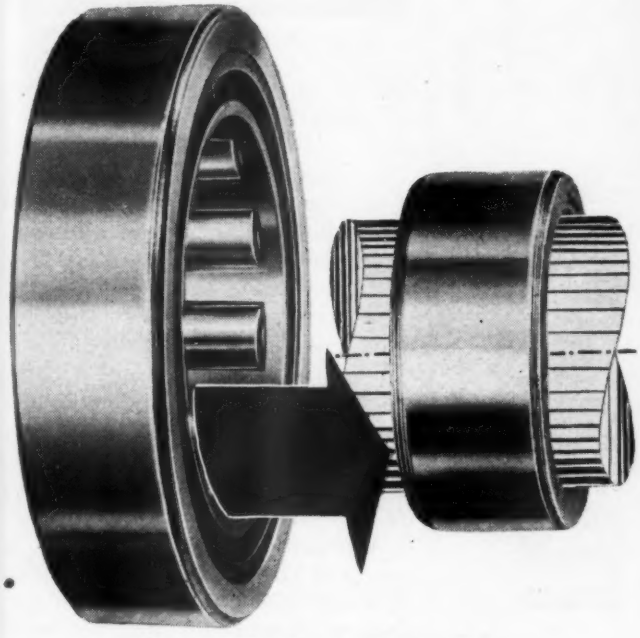
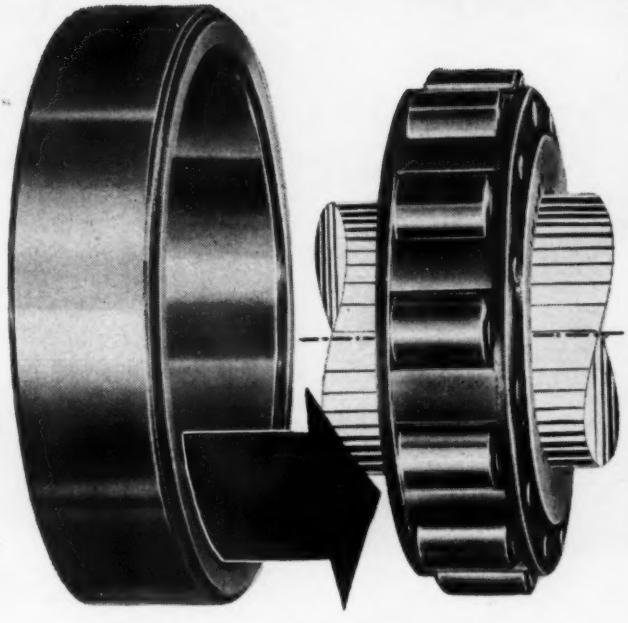


Separable Inner Race Type



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Hyatt Hy-Load Bearings are made in separable types as well as in self-contained units. In the separable bearings the inner races are the separable units in one instance and the outer races in the other. Thus, the component parts of every separable Hyatt Hy-Load type bearing of a given size are fully interchangeable. Every race fits every roller assembly.

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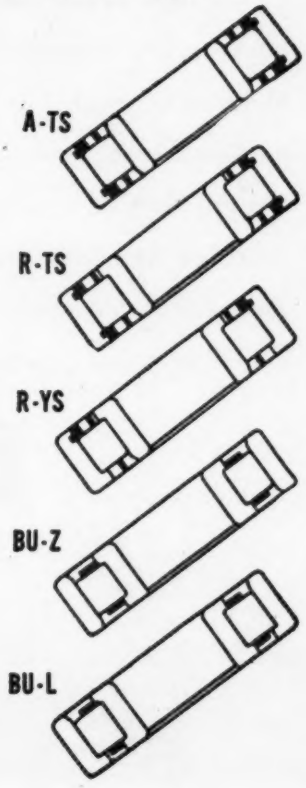

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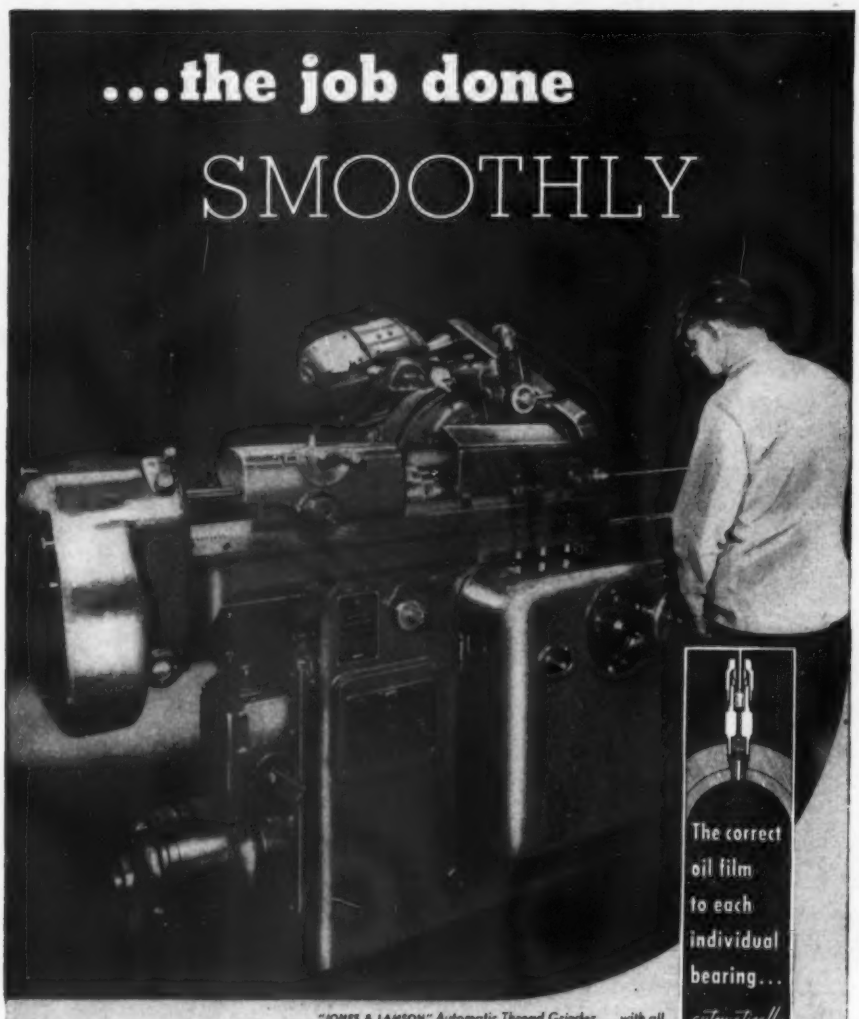

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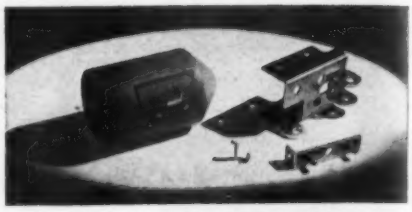

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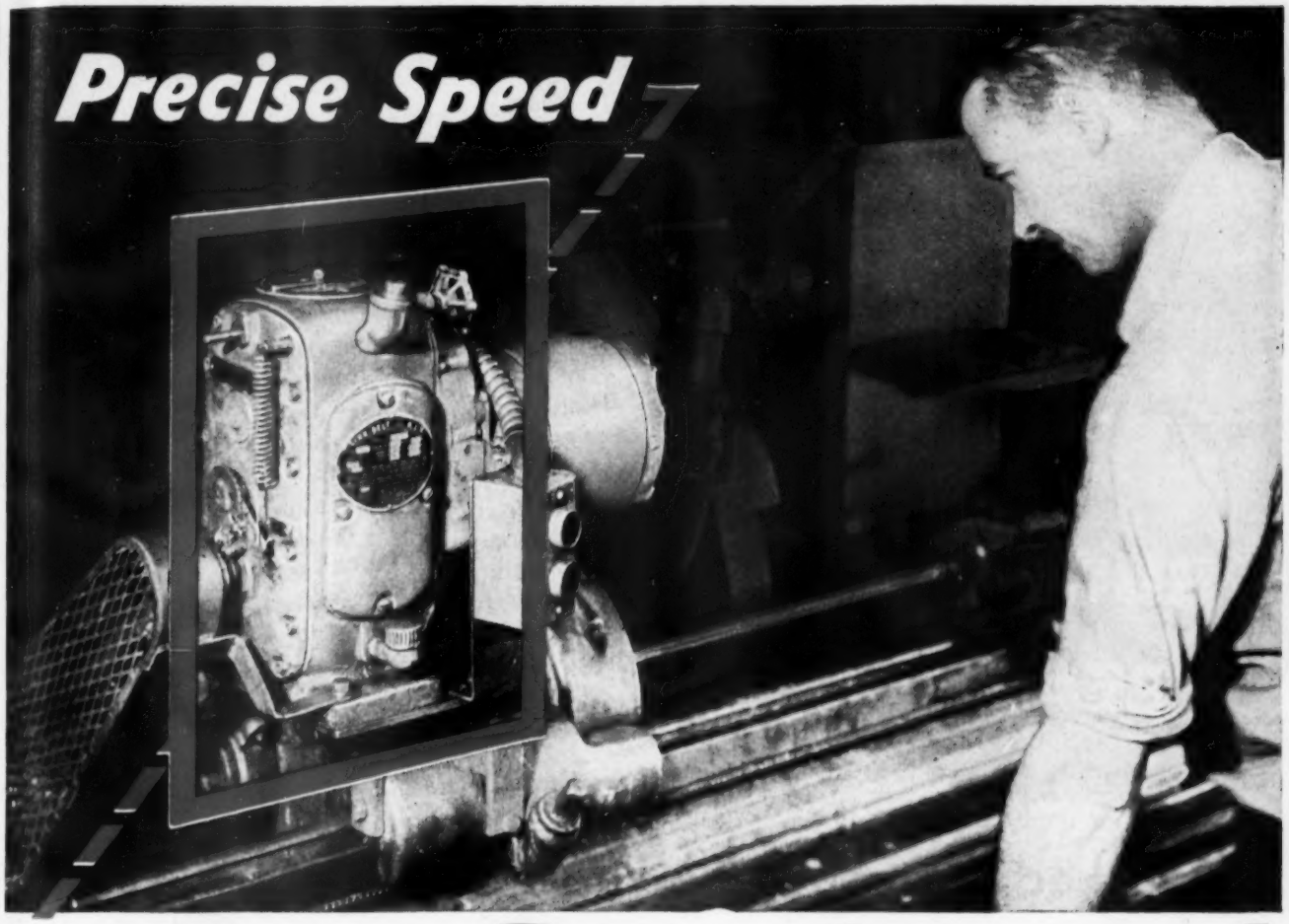

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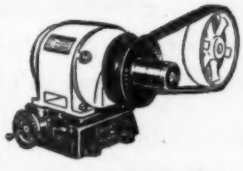

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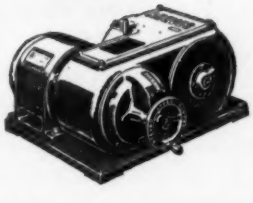

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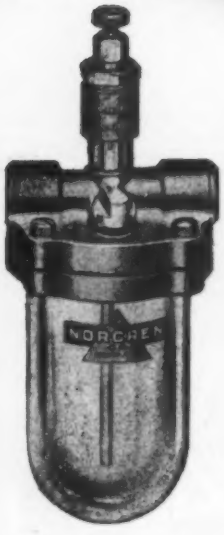

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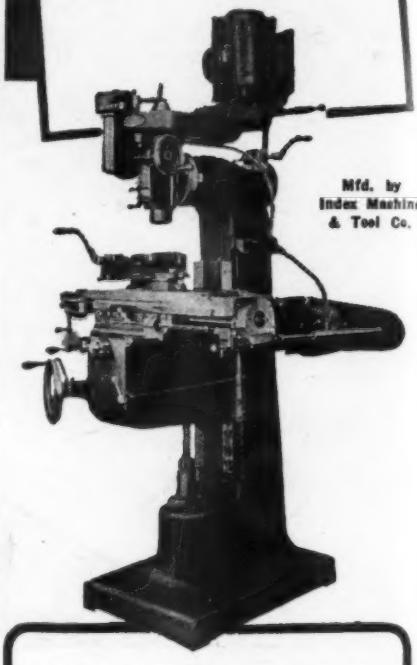

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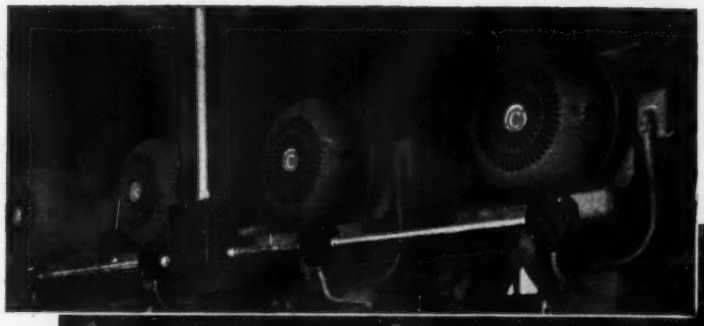

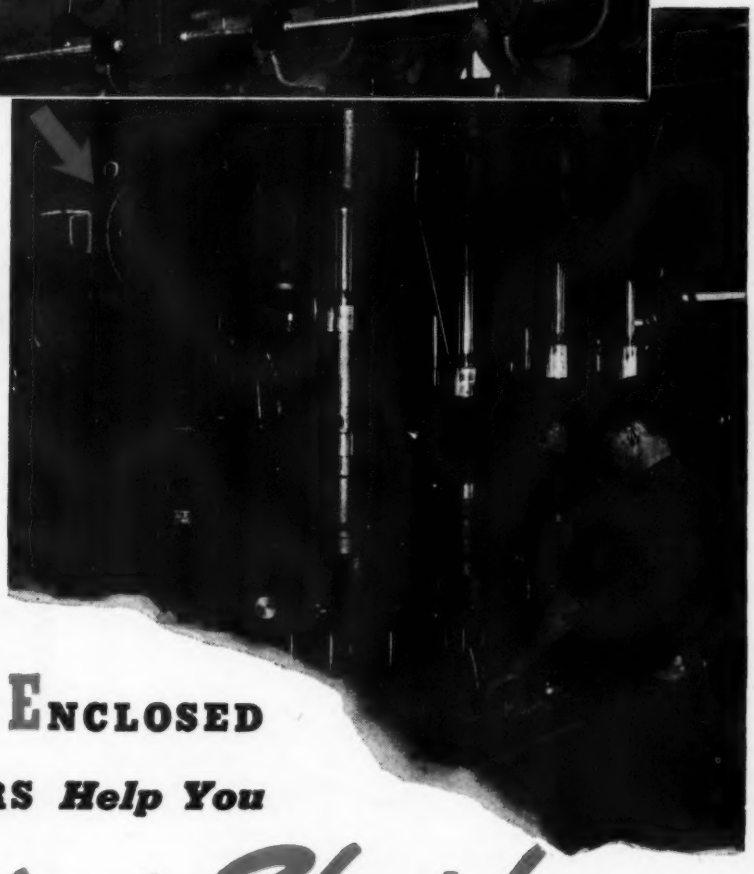

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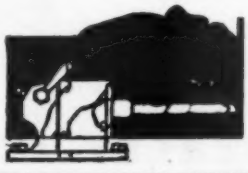

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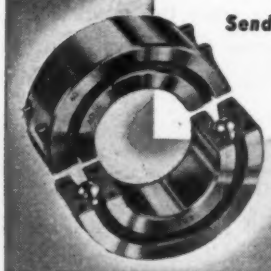

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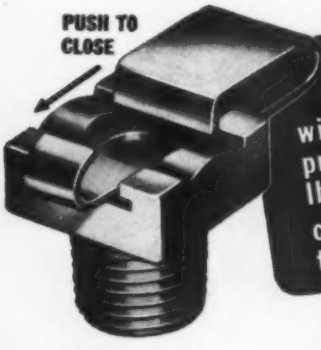
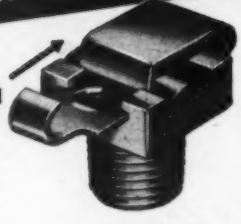


Can you use a new drain cock that—
will operate under pressures up to 200 lbs. per sq. inch?
can be used with all types of liquids?

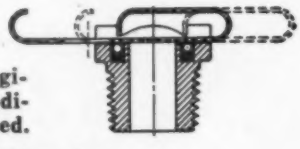
VALVE OPEN

TO OPEN



VALVE CLOSED

The construction of this new drain cock is so simple that the possibility of functional failure is reduced to a minimum. It has but four working parts and is sealed with a standard "O" type ring that can be easily replaced. Its sturdy and rugged construction, lightweight, positive seal and minimum of working parts make this drain cock a possible must in all postwar water, fuel an hydraulic systems. For full information write the engineering department and indicate use or application desired.



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When the requirements covering the turbine gear shown here were submitted to Sier-Bath, a problem was presented which involved the kind of gear cutting equipment which should be used to produce these gears to the tolerances called for. Because Sier-Bath experience indicated the unsuitability of conventional equipment for the job, a special machine was developed to meet Sier-Bath specifications.

All gears regardless of size or type are carefully checked at every step in production to insure the maintenance of Sier-Bath high quality standards.

Prompt estimates on producing gears from 2" to 52" will be furnished by Sier-Bath. Early deliveries can be made on gears to your specifications

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The Doorway to 40 years experience in making Precision Gears

The New Great Lakes
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The New Great Lakes Flat Broach Sharpener and Back-off Machine will handle all your service requirements. Further information and specifications will be sent on Request.

SPLINE BROACHES UP TO 84 INCHES LONG. Complete Broach Tooling and Engineering SERVICE . . . GAGES, Serration or Spline, male or female . . . Master Gears and Gear Racks . . . Master Index Plates . . . Splined Arbors for gear-grinding . . . Hobbing, Shaving and Checking . . . Production Broaching and Machining. *Available from stock: Radius gages for checking form and hook on broach tooth forms.*

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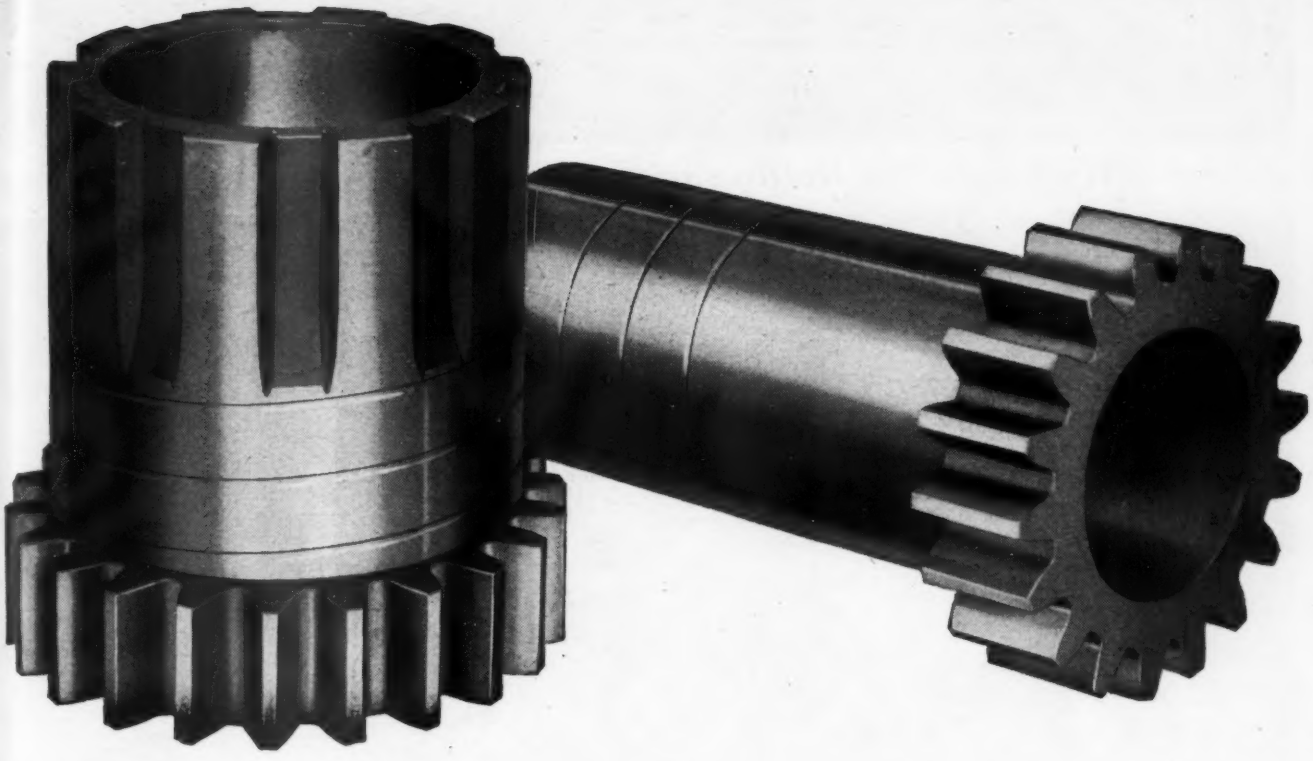

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Splined Shafts
Worms
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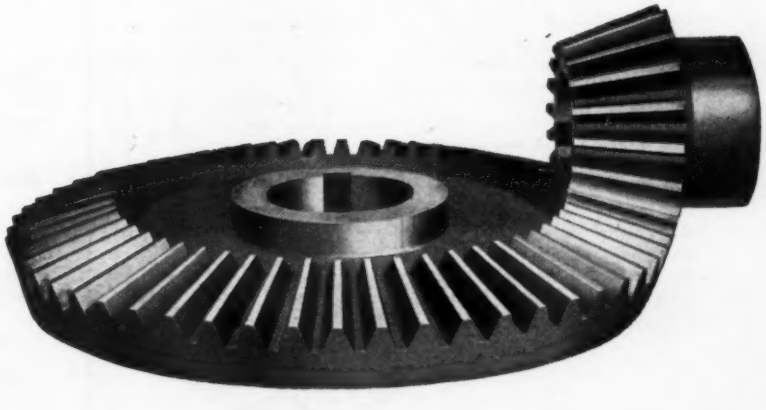
Adams Gears are produced with the finest production and inspection equipment obtainable and they can be furnished to your most exacting requirements.



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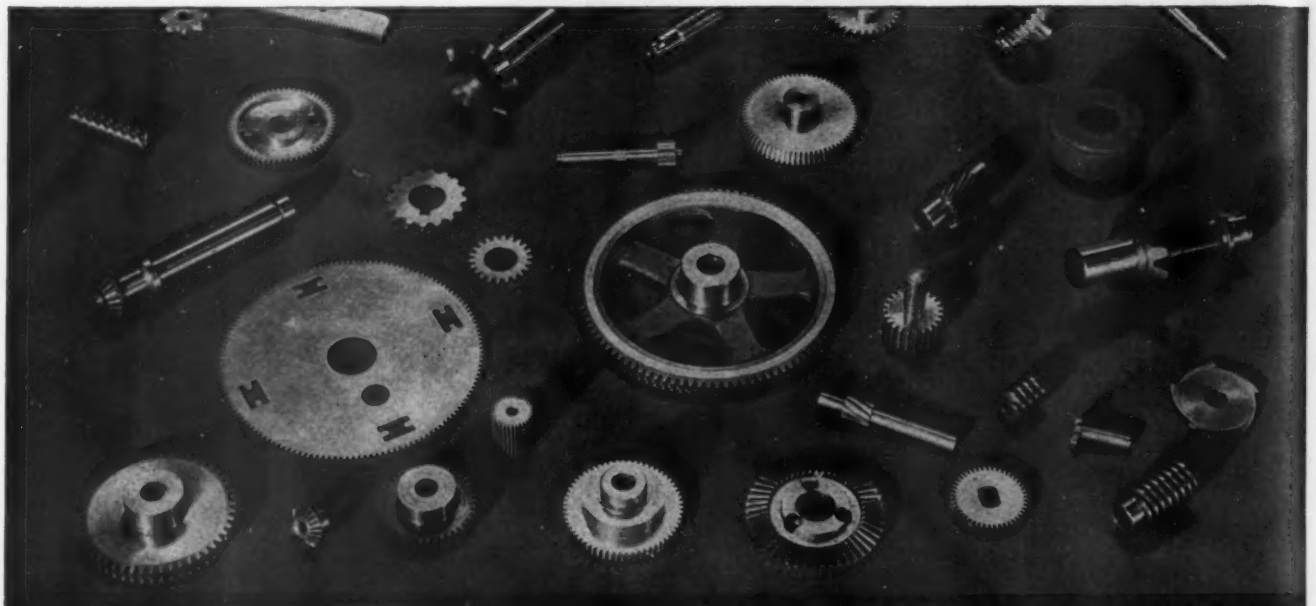

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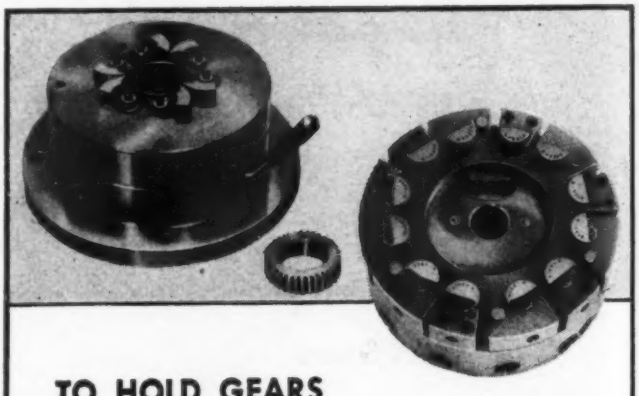

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with precision for boring or grinding
HAVE TEETH GRIPPED ON LINE OF ACTION
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Method eliminates distortion. Gears have perfect, round holes. Made for internal and external gears, for spur and helical gears, and for countershaft type gears.

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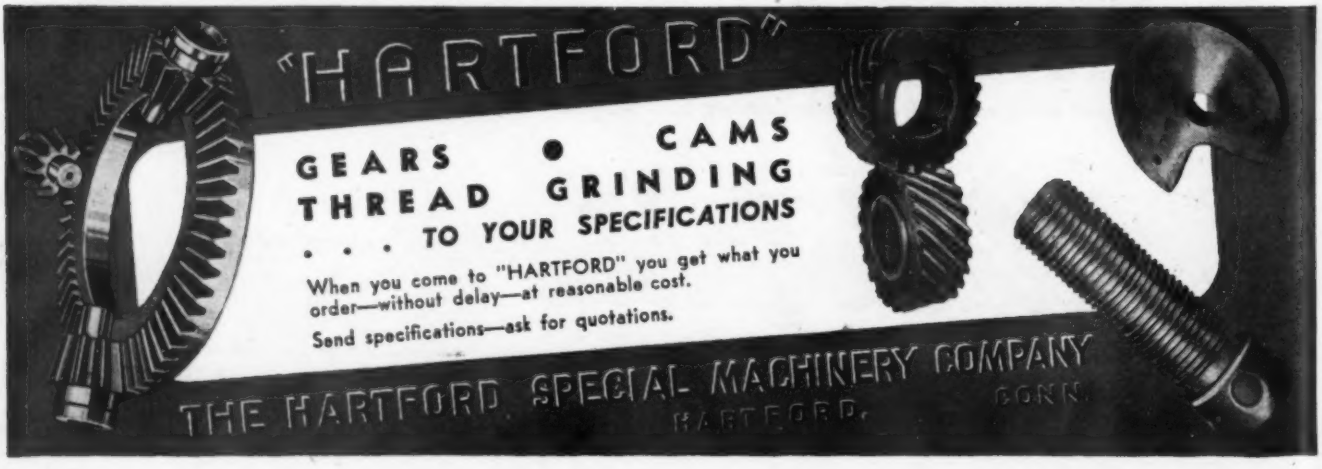

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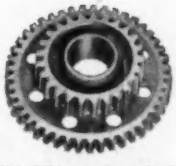
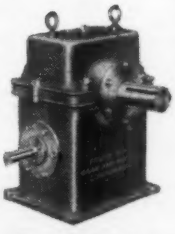


"A-Q" (aircraft quality) Gears

Industrial Gears



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Back in 1859 when Foote Bros. was founded, America was on the threshold of a mighty industrial development. At that time many foresighted planners looked to Foote Bros. for the solutions of their problems in mastering power.

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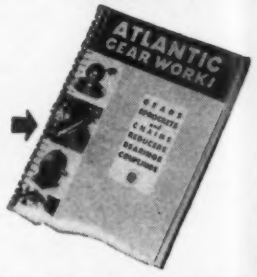

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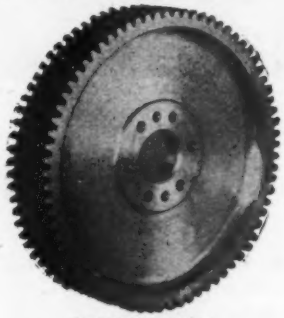
Precision made gears. In a very extensive range from ¾″ to 150″ in diameter and 32 DP to ¾ DP and up to 30″ face.



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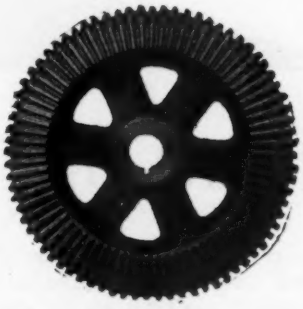
Made from 1 to 60 inches in diameter and from 24 DP to 1 ½ DP. Our helical gear cutting department is capable and extensive.



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Gear teeth are generated on tangential feed hobbing machines by tapered and ground hobs. We make worm gears from 1″ to 100″ in diameter and from 24 DP to 1 DP.

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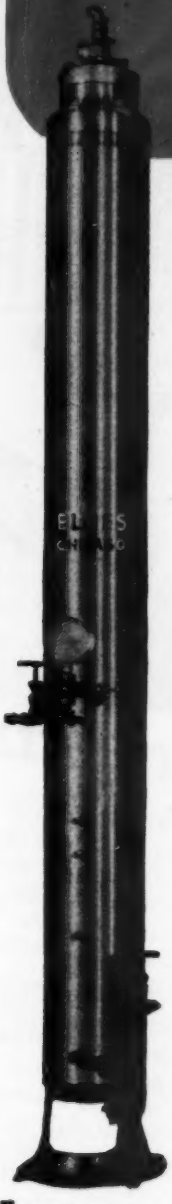

An Elmes accumulator system for group-operation of hydraulic equipment provides a flow of smooth, *abundant* power from a *single,* dependable source.

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Straightening is just one example of the amazingly wide range of production operations to which the basic MULTIPRESS (as shown below) can be quickly adapted. Other accessories include Motor-driven Indexing Tables, Automatic Cycling Action, Vibratory HydrOILic Pressure Ram Action, and others. Only 16 inches wide, 26 inches deep, and 34 inches high, the unit is a completely self-contained, motor-driven, oil-hydraulic machine tool . . . delivered ready to go to work after electrical connections have been made. Write for details!

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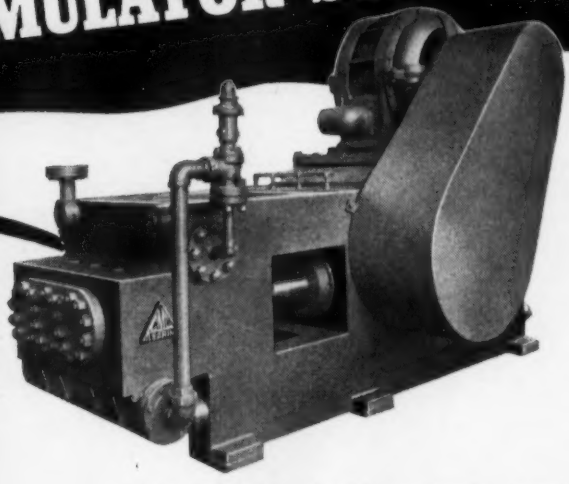
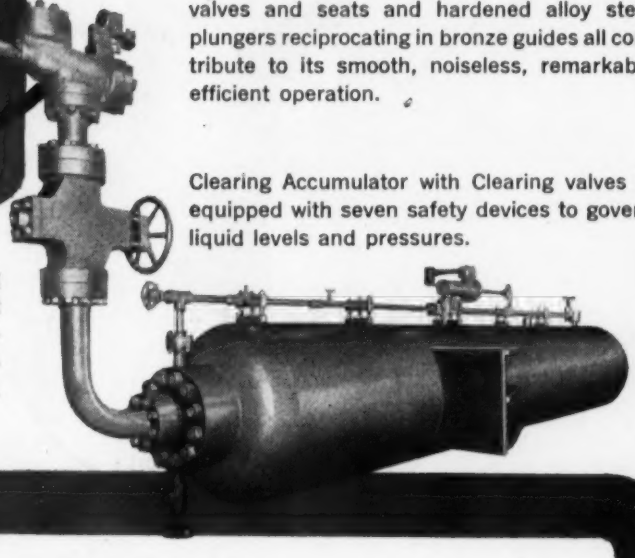
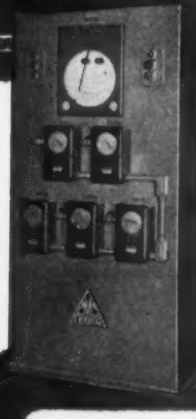
CLEARING HYDRAULIC ACCUMULATOR SYSTEMS



This belt-driven Clearing Hydraulic horizontal pump has fully enclosed crankless drive running in oil. Anti-friction bearings, alloy steel valves and seats and hardened alloy steel plungers reciprocating in bronze guides all contribute to its smooth, noiseless, remarkably efficient operation.



Clearing Accumulator with Clearing valves is equipped with seven safety devices to govern liquid levels and pressures.



The unusually simple Clearing Automatic Control does a perfect job of controlling loading and unloading of pumps at predetermined and adjustable pressures.

Products of the same engineering skill and ingenuity responsible for Clearing Presses, these Clearing Hydraulic Accumulator Systems give shockfree, reliable performance at all times. Designed for working pressures up to 6,000 PSI, Clearing Accumulators can be furnished in any capacity required for press installations of any size and type. The pressure demands for any operating speed or production rate can be met. Write today for detailed information. Please state your exact operating requirements. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

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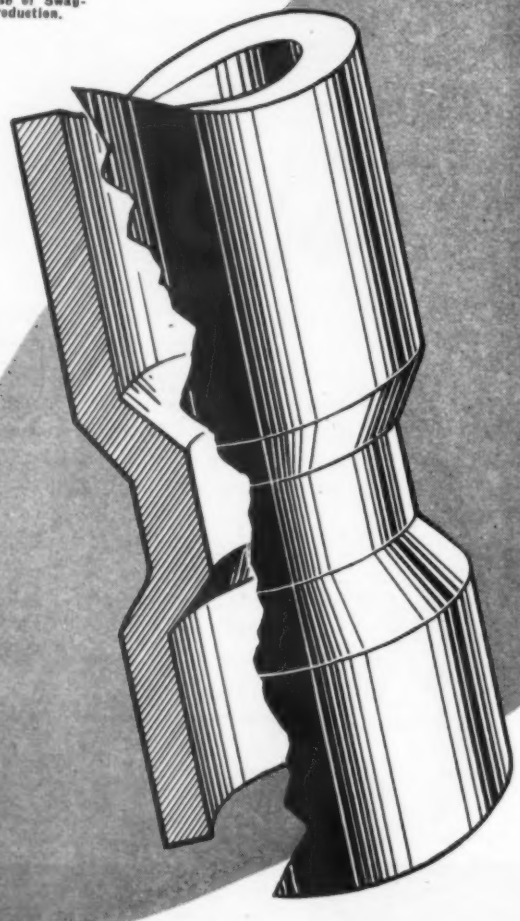
WITHOUT MACHINING?

Fourth of a series illustrating the use of Swaging in war production.

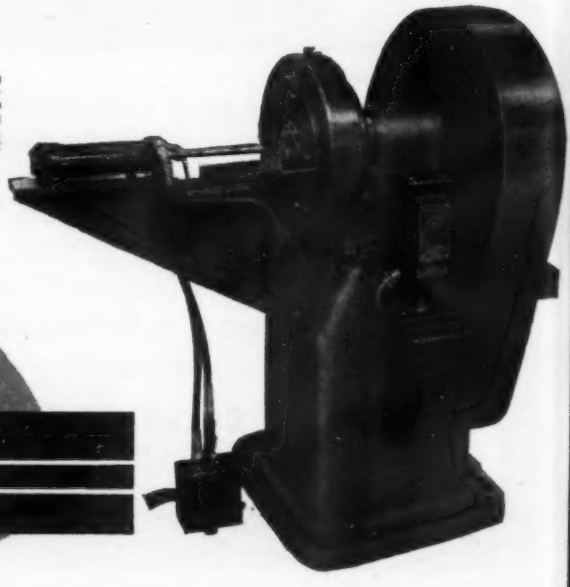


ETNA SWAGING UNITS Can... and do!

"Don't waste it . . . swage it and save it!" That thought, if remembered and applied in your plant will save dollars, time and metal for you! On most any operation that involves complicated tapering, sizing or reducing ETNA Swaging Machines will do the job with extreme accuracy and *without machining*. Swaging eliminates preliminary machining operations and saves material—for with Swaging no metal is cut away. Rather it is compressed, thus strengthening the metal structure!

A note to ETNA today, describing your tapering, sizing or reducing problems will bring complete, descriptive material on Swaging as applied to your particular operations.

ETNA Swaging Machines are built in standard sizes with maximum capacities from ⅜" to 6"—die lengths up to 18" for tapering, sizing and reducing of hollow, solid round or angular parts. Larger sizes up to 14" dia. are built to order.



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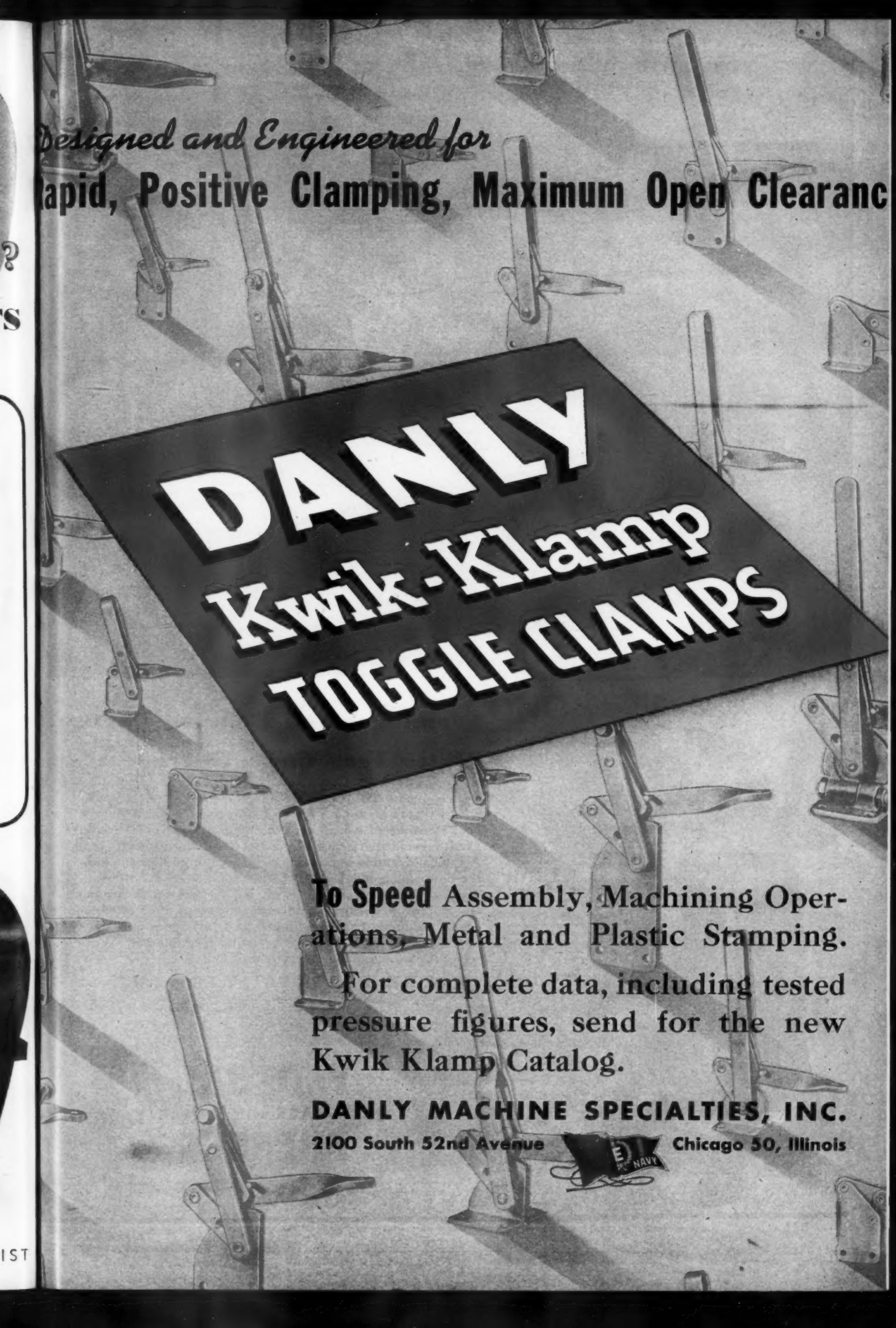
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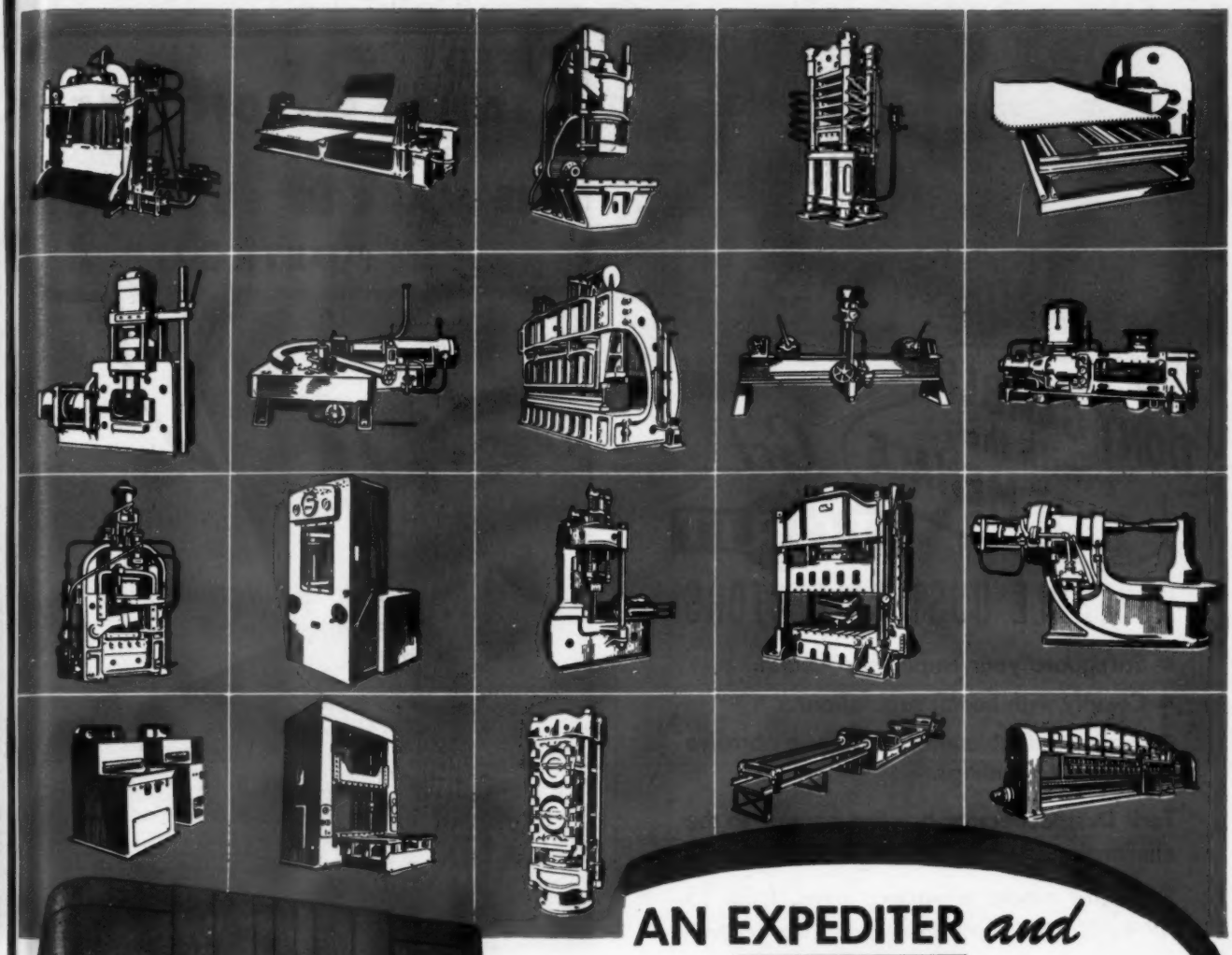

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500 ton single-acting press with stripper in moving platen and provision for die-cushion. Controlled by either hand lever or push-buttons. Note the clean, compact design.

Baldwin presses help you get jobs out quicker and cheaper today—and are excellent "life insurance" for companies that must meet uncertain competitive conditions tomorrow. Experience has proven that presses are at the top in the list of the most important modern production tools.

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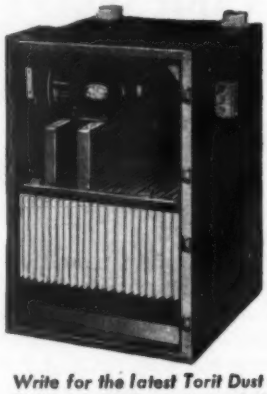

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LEHIGH S · LEHIGH H · LEHIGH L

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Grade	LEHIGH S	LEHIGH H	LEHIGH L
Type	Oil-hardening	Air-hardening	Oil- or air-hardening
Abrasion-Resistance	1*	2*	3*
Shock-Resistance	3*	2*	1*
Primary Alloying Elements	C 2.05 Cr 12.00 V 0.60	C 1.65 Cr 11.50 V 0.40 Mo 0.80	C 0.85 Cr 11.50 V 0.30 Mo 0.45 Ni 1.00
Typical Uses	Blanking, punching, forming, and thread-rolling dies; lamination dies for high-silicon sheets; shear blades and rotary slitters for thin-gage material (pickled or cold-rolled).	Blanking, punching, and forming dies; master tools and hobs; mandrels, gages, taps; bending or forming rolls.	Punching, forming, and trimmer dies; flying shear blades for continuous sheet and strip mills (sheets, bright and unpickled or unscaled; plates up to ½ in. thickness); thread-rolling dies.

*1—*Highest of group.* *2—*Medium.* *3—*Lowest of group.*

These three steels are aristocrats of the tool room; yet none of the three is a "fussy" steel, none is hard to handle. Once you've stocked and used them, they'll always have a place in your inventory. Ask your Bethlehem distributor for further details.

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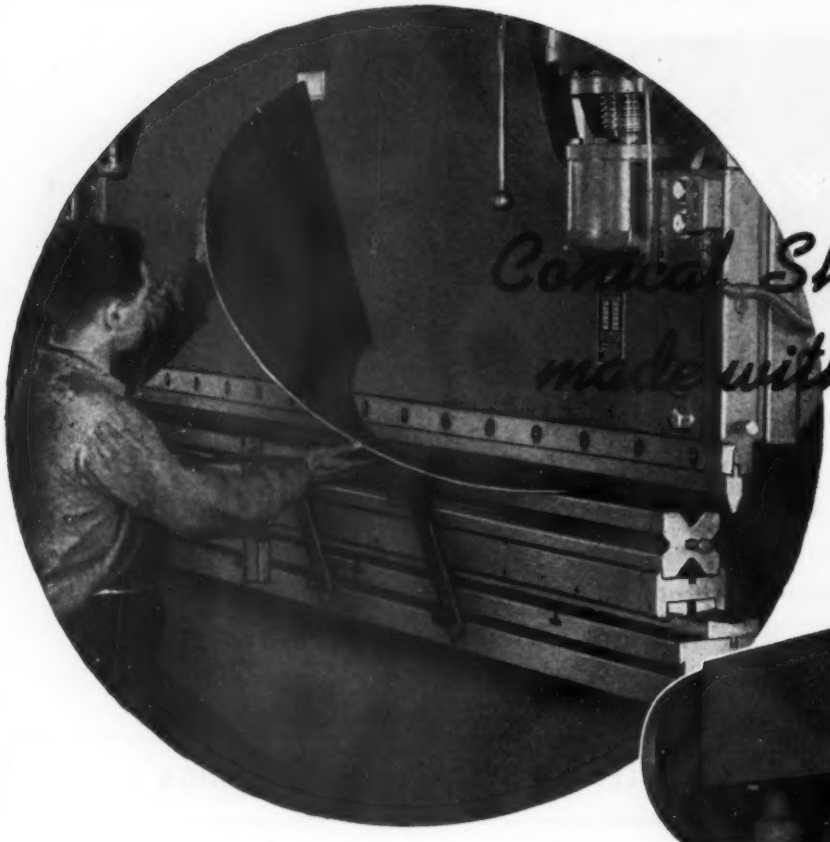

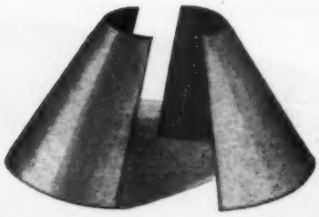

Conical Shapes quickly made with bending dies

Conical shapes are easily made on Cleveland Steelweld Presses with the same dies as are used for straight bending work. The ram-tapering mechanism, one of many exclusive Steelweld features, makes this possible.

For bending, forming and punching metal — single jobs or large production runs — Steelwelds are versatile money-making tools, easily operated by inexperienced workers. Often the same dies will perform many kinds of work. When necessary to change dies, it is usually a simple matter, quickly done.

The illustration above shows conical-shaped bottoms being formed of 3/16-inch plate for buckets 48 inches in diameter.

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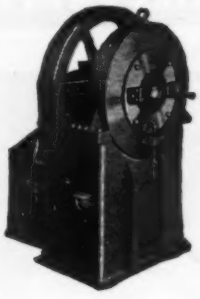

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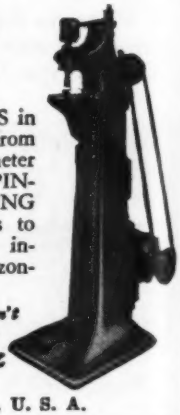

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Fig. 1851

Fig. 1851 — "Hallowell" Tool Stand. Rugged all-steel construction on easy rolling swivel casters make this handy tool stand a lasting aid to efficiency in any shop.

Fig. 1249 — "Hallowell" Steel Stool. Welded steel construction; adjustable spring posture back; heights from 14" to 36" inclusive.

"Hallowell" Steel Trucks roll easily under all loads—their welded construction defies time and abuse. Joints won't loosen and wobble!

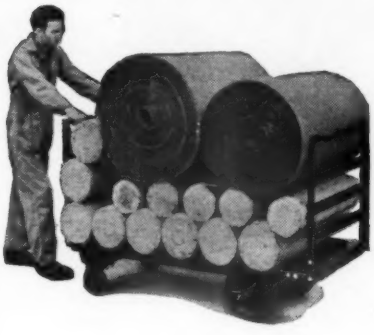

Fig. 1249

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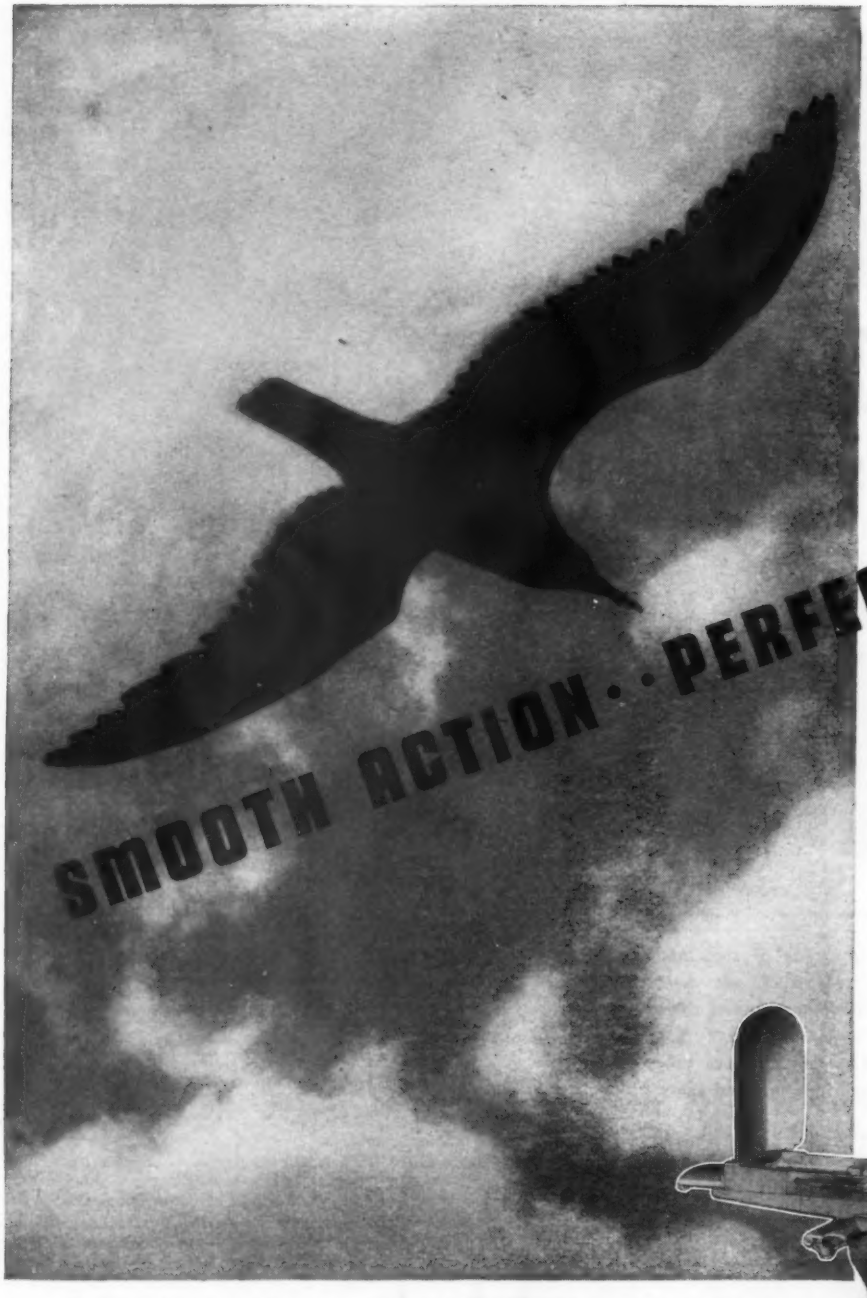

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The smooth action and perfect control of ABRASIVE No. 3-B Surface Grinder contribute greatly to the productive capacity of this versatile machine. Its fast automatic feed and built-in shock absorber permit production of uniform, accurate work with utmost efficiency. The massive one-piece bed casting insures perfect alignment, freedom from distortion and long machine life; oversize spindle of alloy steel, precision ground, drives 10" grinding wheel with minimum vibration. Engineered and built to ABRASIVE's high standards.

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Work capacity:
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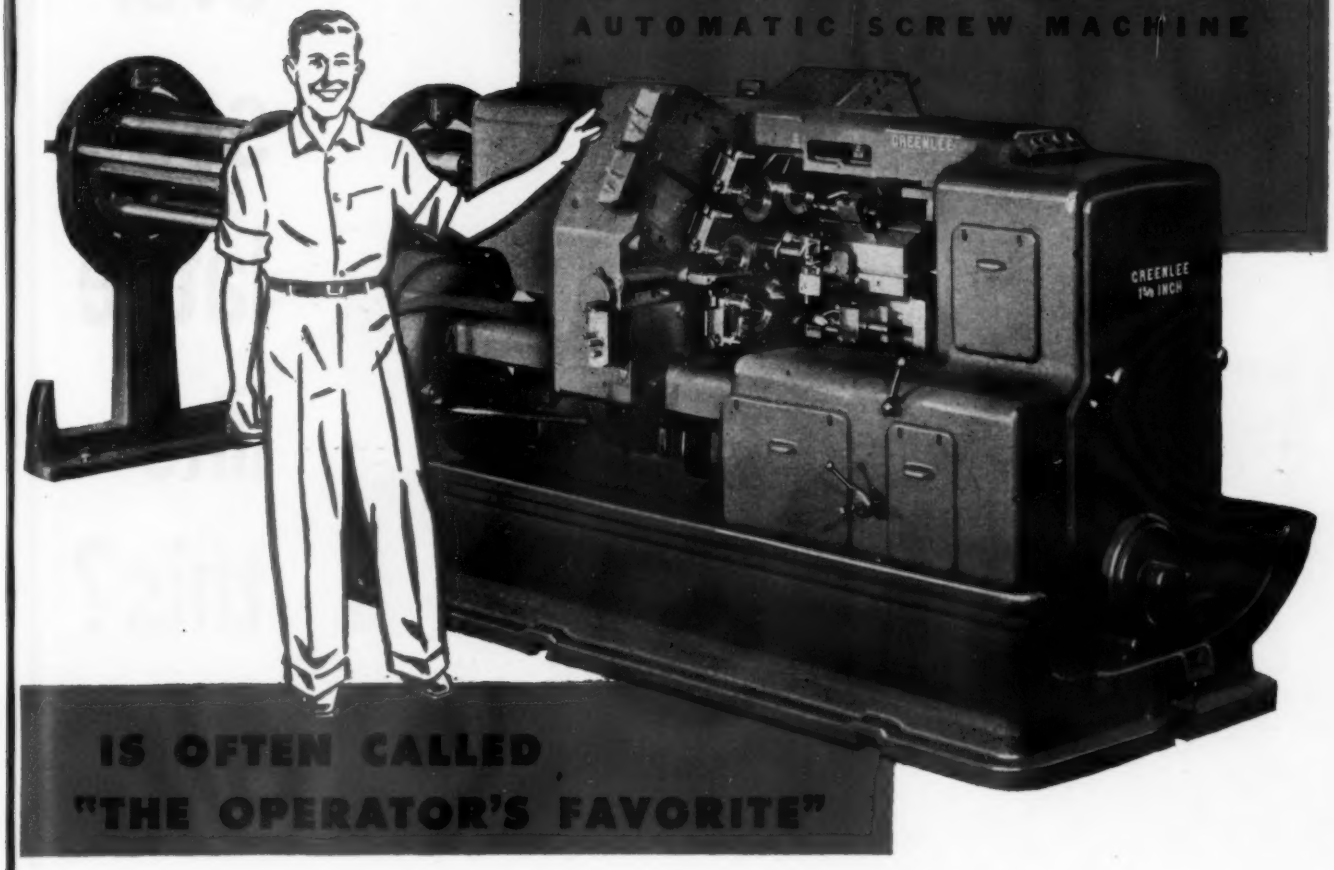

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CONVENIENT machine height with plenty of elbow room in the tooling area affords easy access for adjustments, and for removing tools for sharpening. Everything in the working area is in clear sight and easy reach.

EFFICIENT tooling set-up on independently-operated cross slides simplifies the work of tooling up for a new job or making necessary adjustments on one that is running. The cross slides are arranged the same front and back and the adjustments are brought out where they can be easily gotten at.

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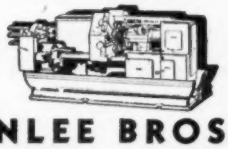
WRITE TODAY  FOR MORE FACTS

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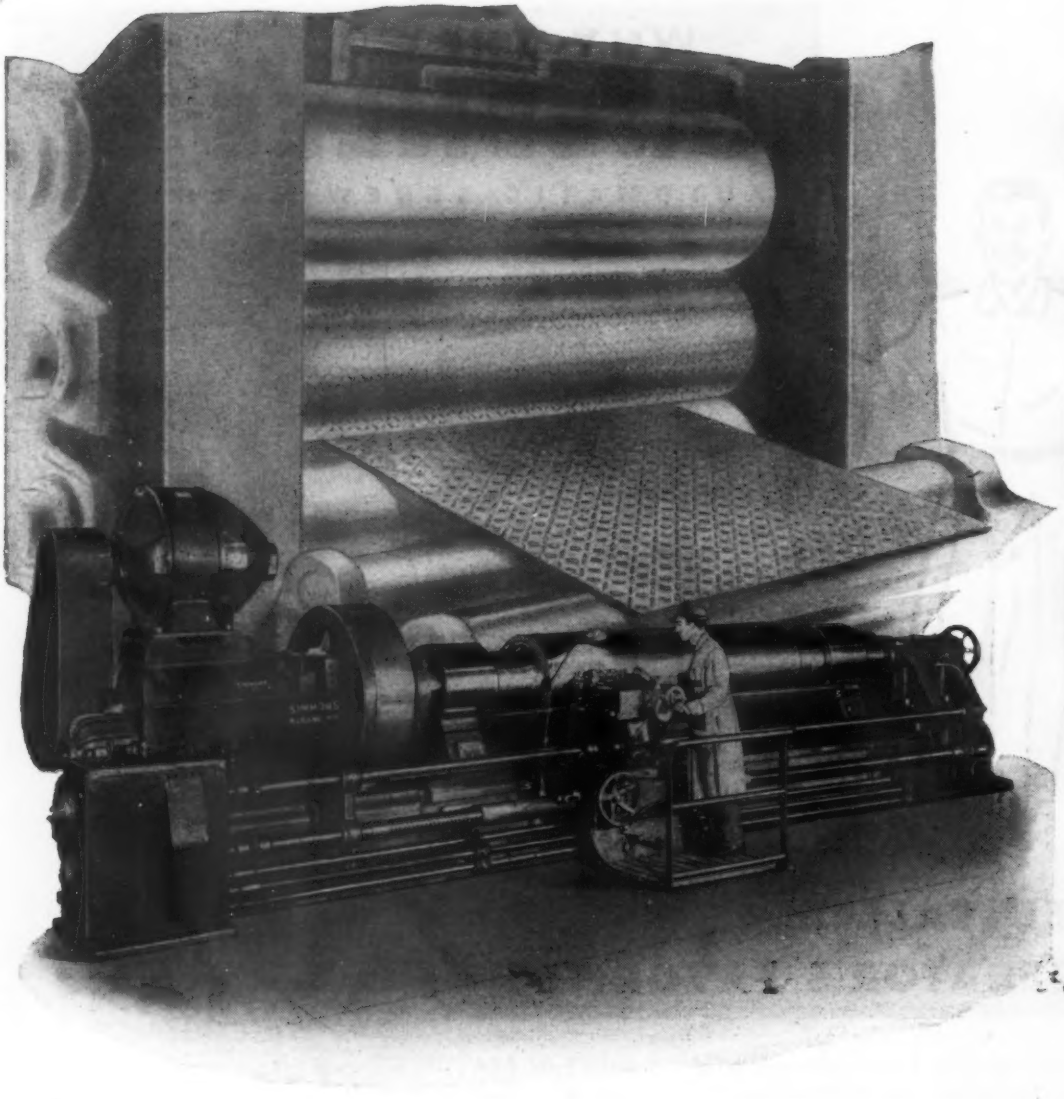

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And it has a special job to do for Carnegie-Illinois Steel Corporation... producing accurately spaced pockets in alloy steel rolls which act as dies to form the cleats on U.S.S. Multigrip Floor Plate.

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You'll want to know more about this unusual company. A copy of "The Simmons Way" will take you on a pictorial tour of our plants. Write for it on your letterhead.

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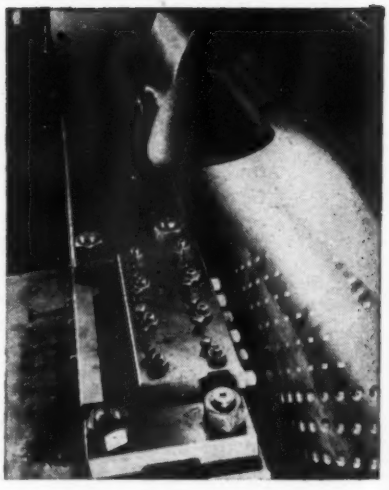

Six cutting tools mounted on tool slides with cam-controlled cross-feed for cutting and relieving action.

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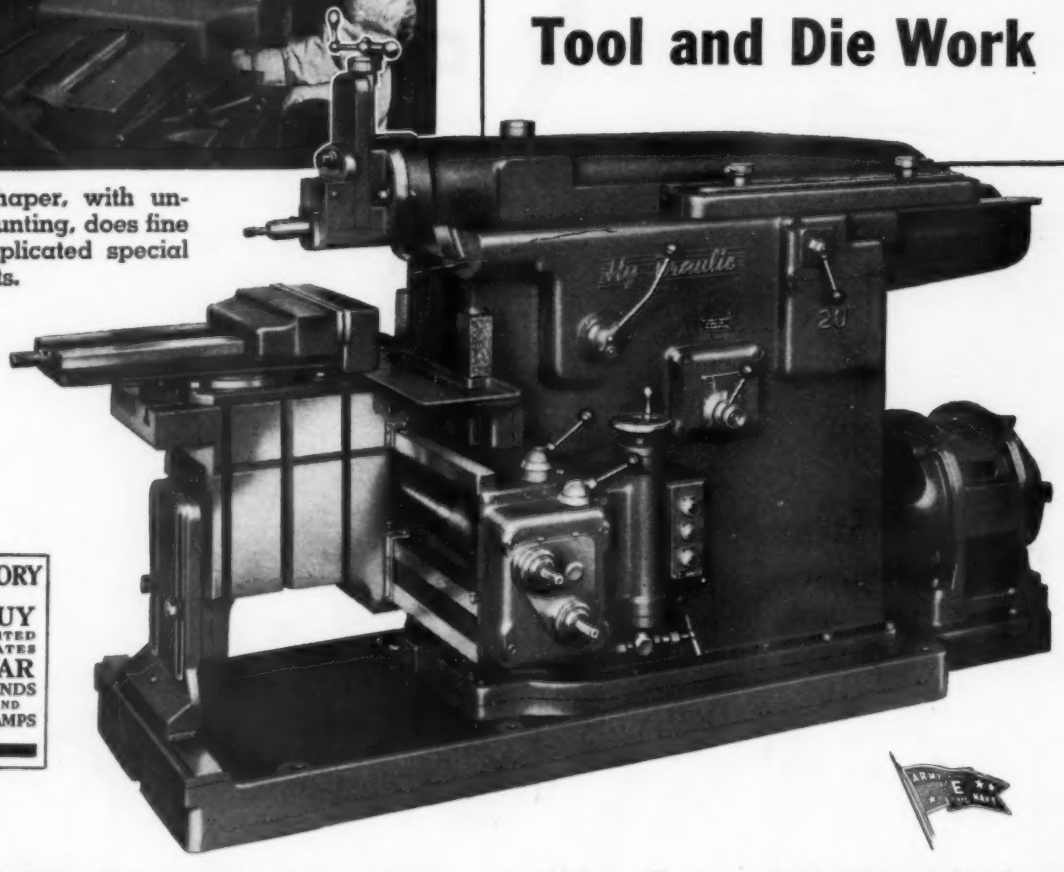

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Illustrated is a Hy-Draulic Shaper working on special ordnance parts machined from the solid out of very tough steel. The toolmaker running this shaper can concentrate completely on the work in process. Right under his hand are controls for rapid traverses in four directions and for hydraulic cutting speeds and feeds. He can get any cutting speed or feed whatever, in specified ranges, without gaps between, without gear-shifting, without stopping the machine. He can get ram-stroke length, and its position relative to the work, in one easy operation without cranking or using tools. These, and other Hy-Draulic advantages, save operator's time, speed production and promote economy on fine tool and die work . . . on run-of-mill shaper operations also. Investigate. See what Hy-Draulic Shapers can do on your work. Write us for name of nearest dealer, and ask for Bulletin 1122.

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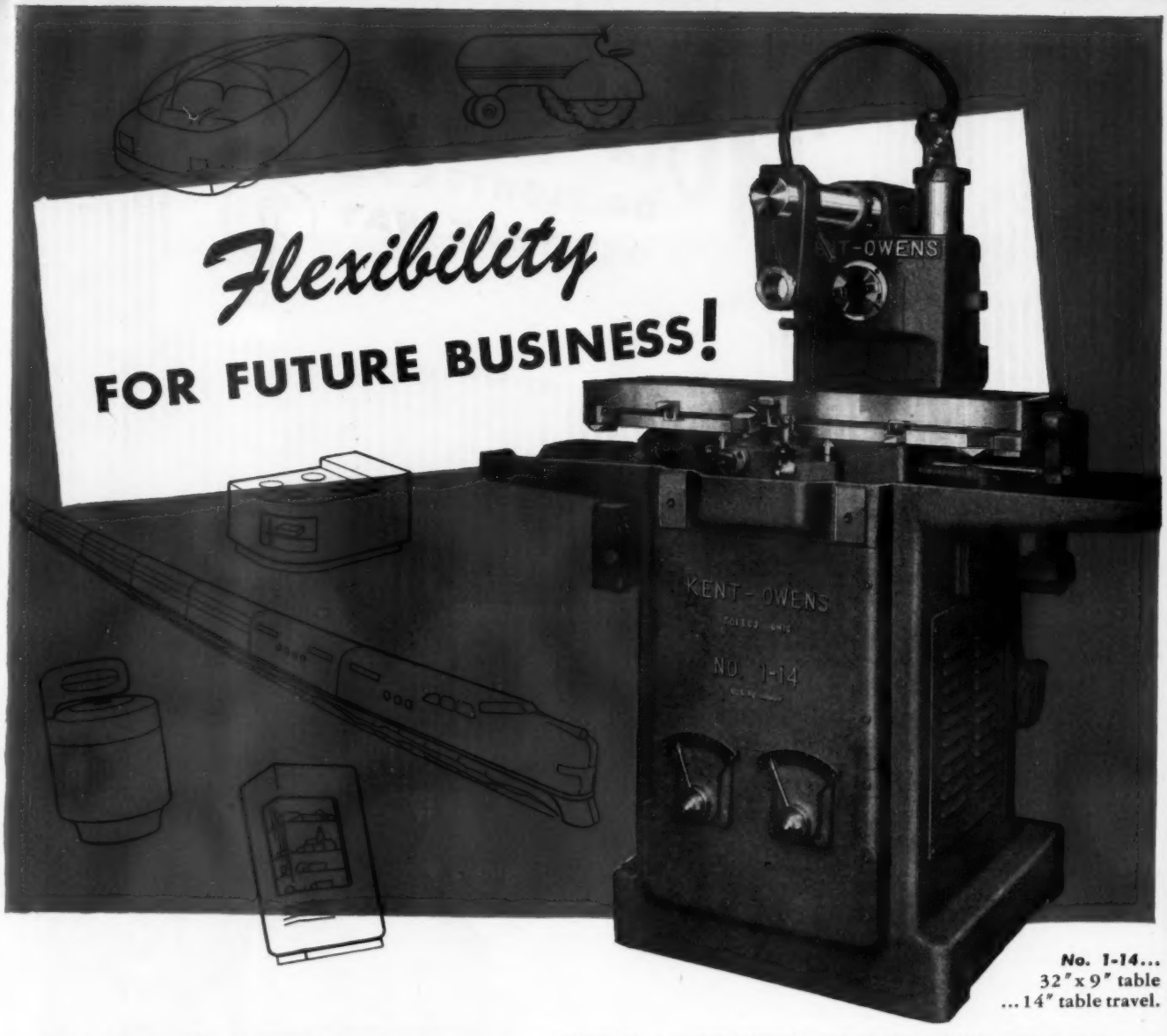

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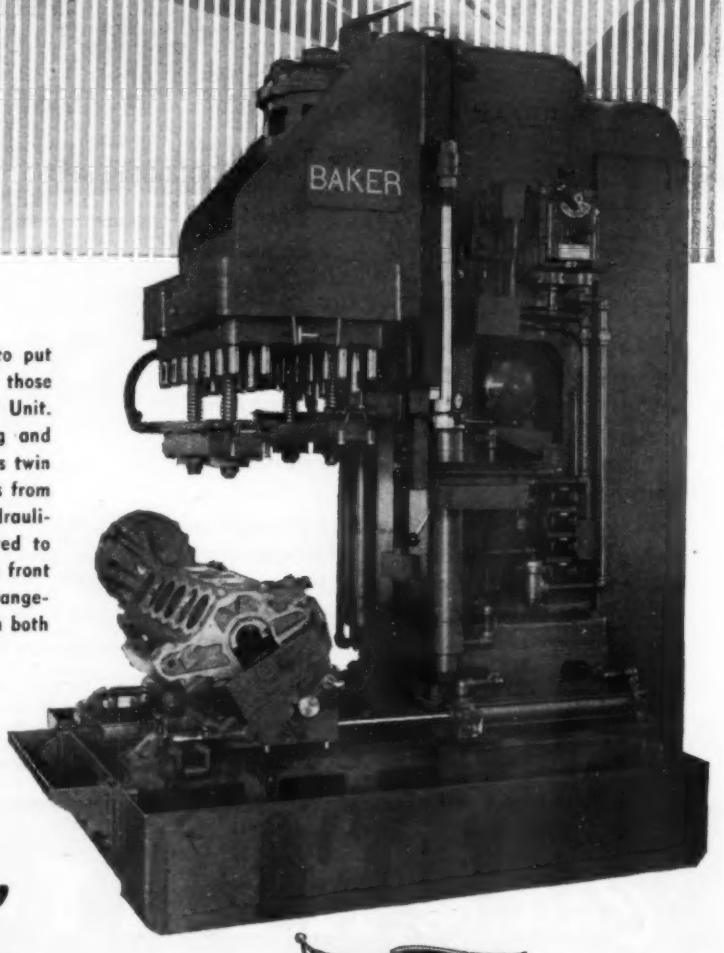
How DO FIGHTER PLANES GET THAT WAY?



It takes *machine tools* . . . literally thousands of them . . . to put those AAF fighters in the air. And holding its position among those thousands is this BAKER 60-HO, a Vertical Hydraulic Feed Unit. Tooled up with a 14 spindle head to handle multiple drilling and counterboring operations on aircraft engine crankcases, it features twin pull cylinder construction for feeding and rapid traverse pressures from both sides of the multiple head. The fixture is mounted on a hydraulically operated in-and-out slide, allowing the fixture to be moved to the front for fast loading. This also permits movement from the front drilling station to the rear counterboring station. A pivot arrangement allows indexing work at proper angle to handle operations in both banks of the engine.

Just as BAKER engineering helps to speed the output of aircraft components here, so it can boost production efficiency in your plant. Let us know about your drilling, boring, and tapping problems. We'll be glad to work with you.

BAKER Bros., Inc.

Single and Multiple Spindle Machines for Drilling, Boring and Tapping

TOLEDO 10, OHIO

ARMY E NAVY

FORM AND MULTIPLE THREAD CUTTERS, H.S.S. OR CARBIDE

Plan-Co Form and Thread Milling Cutters are the product of years of on-the-job milling experience. Made by the makers of Plan-O-Mill Form and Thread Milling Machines, they incorporate improvements developed and pioneered by Plan-O-Mill engineers.

Plan-Co Form and Thread Milling Cutters offer you: (1) Exacting accuracy and exceptional finish. (2) Increased output and longer tool life, due to greater wear resistance.

Every Plan-Co cutter is subjected to rigid inspection with modern equipment before being approved for delivery to you.

FIRSTS by PLAN-O-MILL

1. First to install General Electric's remarkable new Thy-mo-trol electric feed control!
2. First planetary to mill external threads with standard multiple thread cutter!
3. First planetary to coordinate feeds and speeds!
4. First to provide absolute control of feed-in!
5. First to offer a practical, low cost carbide thread milling cutter!

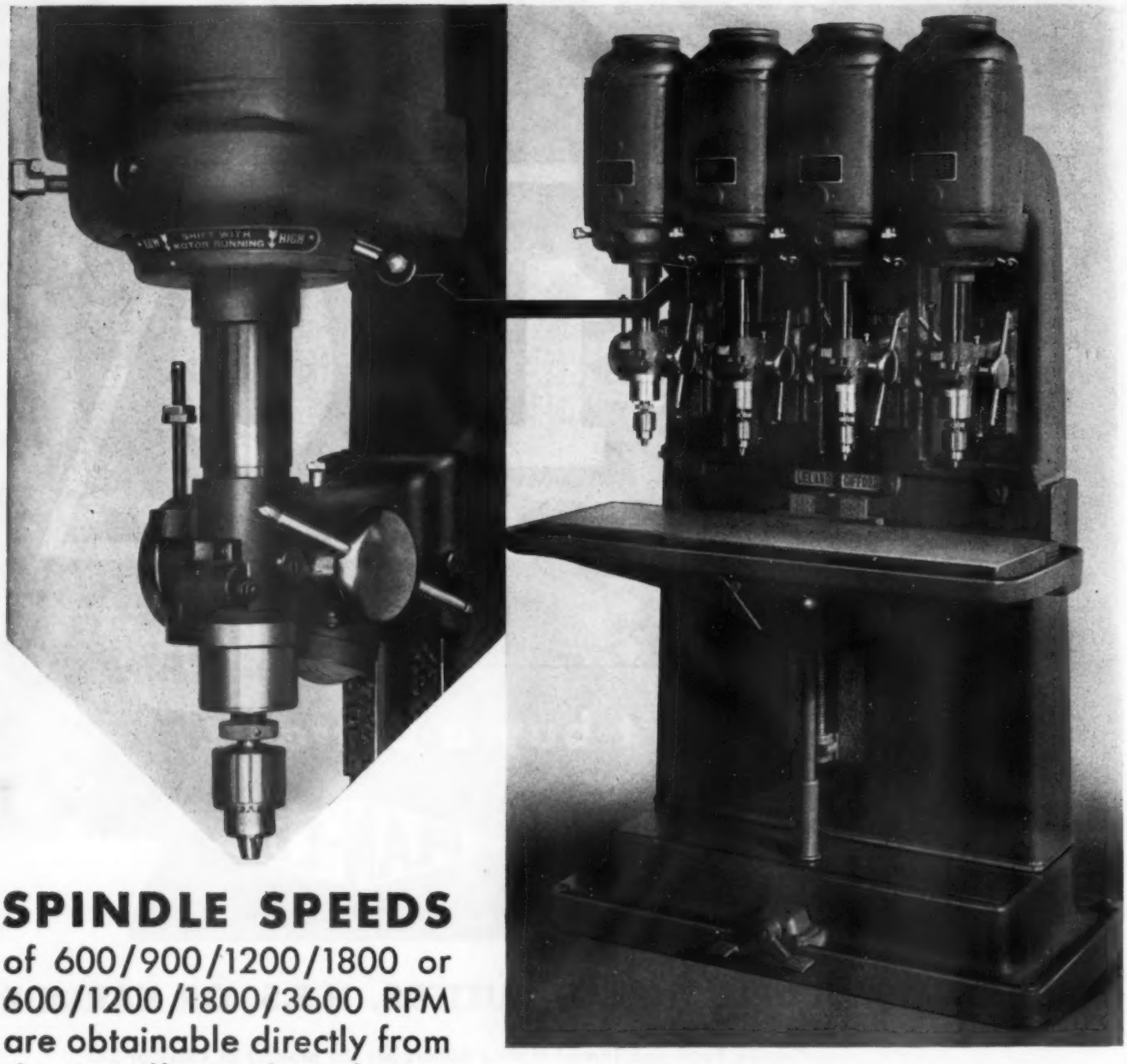
PLAN-O-MILL CORPORATION

1511 EAST EIGHT MILE ROAD

HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-CO MILLING CUTTERS



SPINDLE SPEEDS
of 600/900/1200/1800 or 600/1200/1800/3600 RPM are obtainable directly from the Totally Enclosed, Fan Cooled, Ball Bearing Motors on . . .

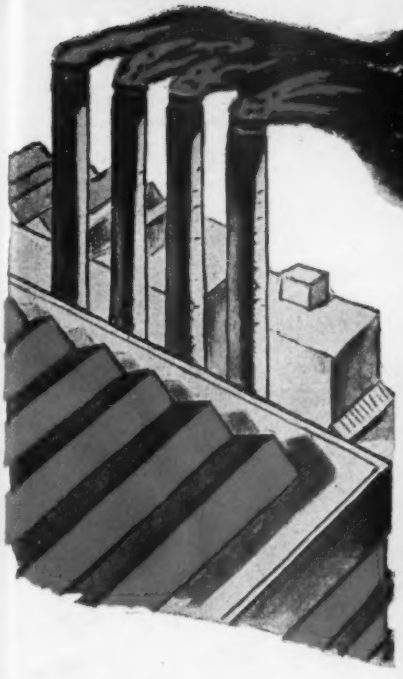
LELAND-GIFFORD No. 1 LMS DRILLING MACHINES.

When higher speeds are needed, a slight movement of the Shifter Lever which engages the ROLLER FRICTION SPEEDER used with the 1800 top speed motor gives FOUR ADDITIONAL SPEEDS of 3000/4500/6000/9000 RPM.

NO GEARS OR BELTS and the speeder can be ENGAGED or DISENGAGED *without stopping the motor.*

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.



DON'T LET PRE-WAR METHODS KILL POST-WAR PROSPERITY!

The war years have proven to American Industry that the light machine tool has an important place in Production. Walker-Turner machine tools have demonstrated their ruggedness under most exacting conditions.

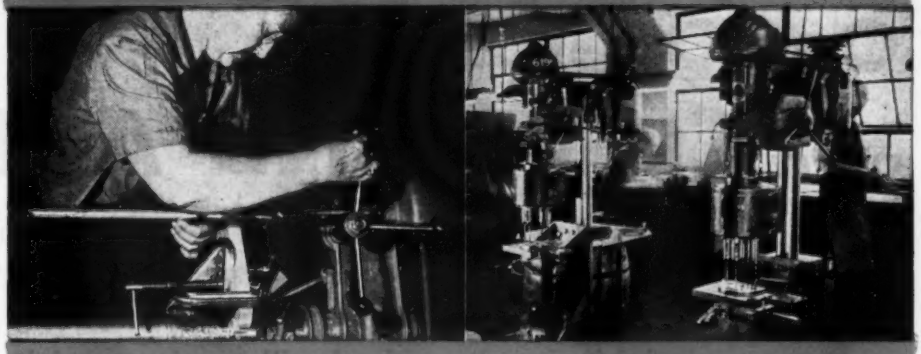
Don't let pre-war operating methods affect your post-war competitive position. The versatility of Walker-Turner machine tools will ensure production equal to—and, in many cases, better than—heavier and more expensive equipment.

WALKER-TURNER COMPANY, Inc.
Plainfield New Jersey

HERE'S HOW WALKER-TURNER MACHINE-TOOLS CUT COSTS!

260-5200 R.P.M. 60-5300 S.F.M. 160-8300 R.P.M.

Wide range of operating speeds enables you to select the optimum cutting speed for any material.



Walker-Turner flexibility saves time and cuts costs in special tooling set-ups.

Set up horizontally, this Walker-Turner 15" Drill Press flares the ends of tubing.

This Walker-Turner 20" Drill Press drills five holes and reams two holes in one operation.

Low power consumption reduces operating costs.

This motor on a Walker-Turner 20" Drill Press provides speeds for drilling up to ¾" in steel, 1" in cast iron.

Low price decreases capital investment.

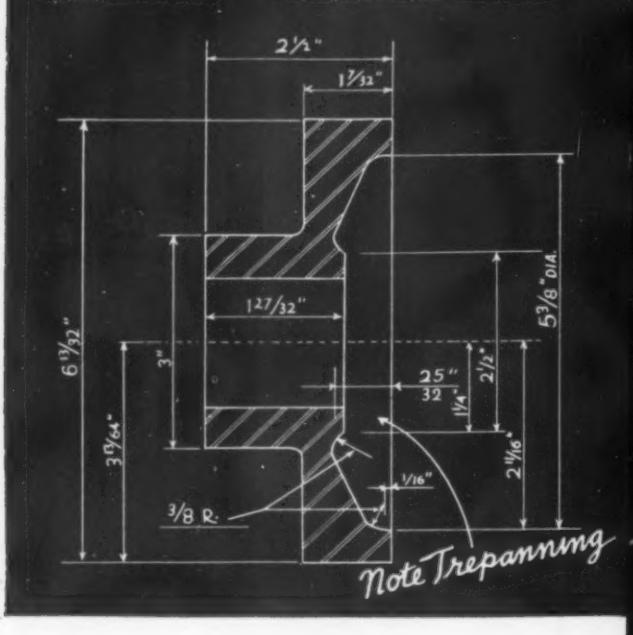
This Walker-Turner 4-spindle 20" Drill Press costs no more than a single heavy unit, yet has several times its production capacity.

walker-turner COMPANY, Inc. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

GEAR BLANKS FROM BAR STOCK



Complete In One Operation on a CLEVELAND AUTOMATIC

Here's another example of modern production thinking plus the advantages of Cleveland Automatic versatility and speed. Some idea of the sturdy cuts made on this 6-13/32" automotive gear blank is given by the type of chipping shown in the illustration at right. Steps are . . Gauge 6-1/2" bar stock from station 1 . . . Trepan on 2 . . . Drill from station 3 while turning OD from center turning stem . . . Form hub and face blank from station 5 . . . Cut off from front cross slide.

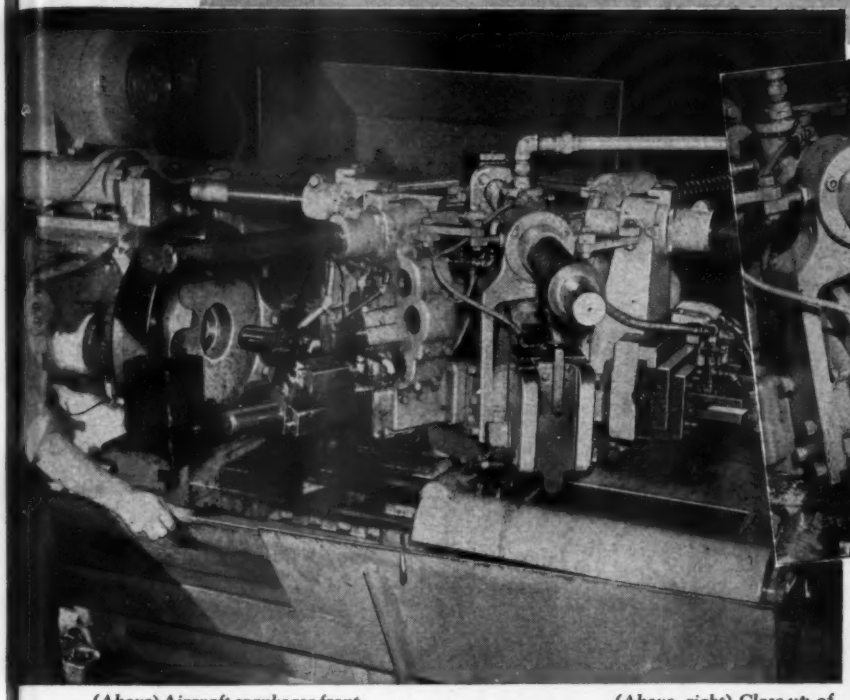
Net production rate information is restricted, but it represents a saving over previous time, which involved two operations in addition to cutting stock. This is a standard Cleveland Model A 8" Automatic.

Remember . . . Clevelands Cut Costs

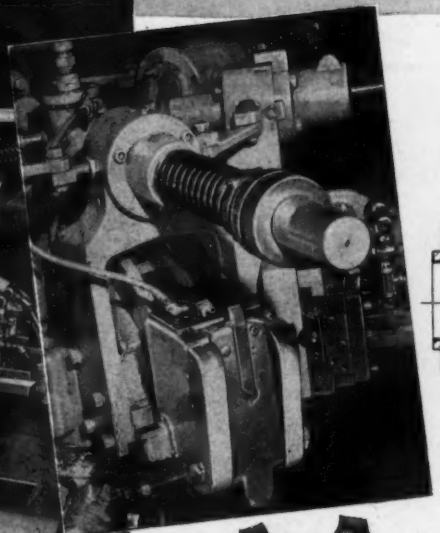
CHICAGO (6):
1408A Civic Opera Building
DETROIT (2):
540A New Center Building
NEWARK (4):
902A American Insurance Bldg.
CINCINNATI (12):
4932A Beech Street
HARTFORD (1):
529A Capital National Bank Building

THE CLEVELAND AUTOMATIC MACHINE CO.

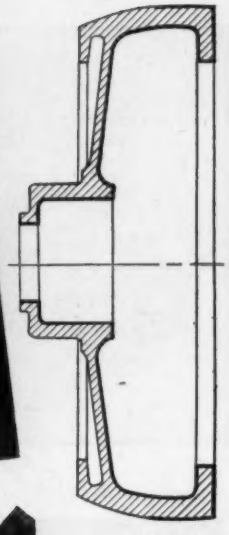
2 SPEEDS and 8 FEEDS *automatically control* 30 MACHINING CUTS



(Above) *Aircraft crankcase front section ready to be machined on a 4FU Foster Fastermatic.*



(Above, right) *Close-up of tooling used to form, generate, bore, turn and face.*



Outline drawing of crankcase section.

Forged steel crankcase front section before and after machining.

• Fastermatic Equipped with Gang Tools Performs Multiple Turning, Boring, Facing, Forming and Generating Operations on Aircraft Engine Crankcase Sections . . .

This case report from the plant of a prominent Eastern aircraft engine manufacturer is further proof of how Fastermatic's automatic speed and feed controls increase machining efficiency. A Model 4FU Fastermatic Automatic Turret Lathe completely machines the inner surfaces of forged steel crankcase sections in 95 minutes and 11 seconds floor-to-floor time.

A total of 30 machining cuts are made with 27 tools, 24 of which are used in gangs on 5 of the turret faces. The 6th turret face is equipped with a special tool which automatically generates the inner rim radius of the crankcase section. Three tools are mounted on the machine cross slides to face the crankcase legs and turn the outer face of the rim.

Four Feeds Automatically Reduced

Operations include turning, boring, facing, forming and generating on hub, web and rim sections of the crankcase. During these operations 2 speeds of 9 and 20 r.p.m. and 8 feeds ranging from .006" to .055" are used, all under complete automatic control. In 4 turret positions, feeds are automatically reduced during the machining cycle as various gang tools engage to assure maximum cutting efficiency. Neither the operating speed of the machine nor the accuracy of the finished piece depends upon the skill or training of the operator . . . his only duties are loading and unloading work. All machining operations, including cross slide and turret movements, are entirely automatic.

How You Can Increase Machining Efficiency

Foster engineers will gladly consult with you in the most efficient solution of your chucking machine problems. Their recommendations on the use of Fastermatic Automatic Turret Lathes can help you achieve greater accuracy, increased production and lower machining costs. There is no obligation whatever for their assistance.

FREE . . . *Valuable Field Case Reports*

This Production Data Book gives detailed information of field cases showing how others use Foster Fastermatic Automatic Turret Lathes to produce both short and long-run work faster, better and at lower cost. Write for your copy now. Address Foster Division, 1100 Beardsley Ave., Elkhart, Ind.

INTERNATIONAL MACHINE TOOLS

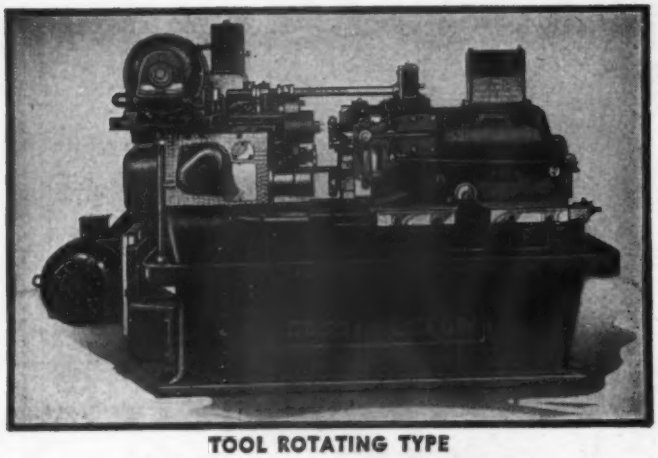
Foster Division - Elkhart, Indiana

INTERNATIONAL DETROLA CORPORATION

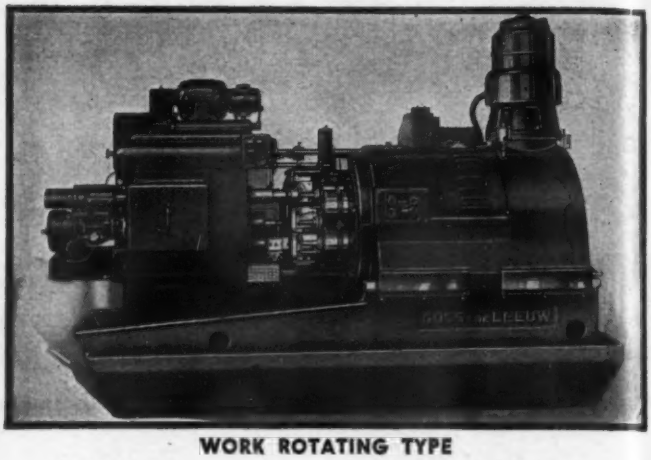
DETROIT, MICHIGAN • ELKHART, INDIANA • INDIANAPOLIS, INDIANA

OSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TOOLS

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



TOOL ROTATING TYPE
4 Spindles • 5 Chucking Positions



WORK ROTATING TYPE
5 Spindles • 6 Spindles • 8 Spindles

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

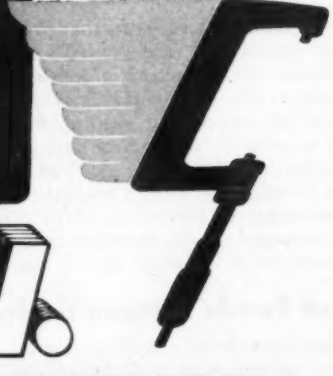
Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

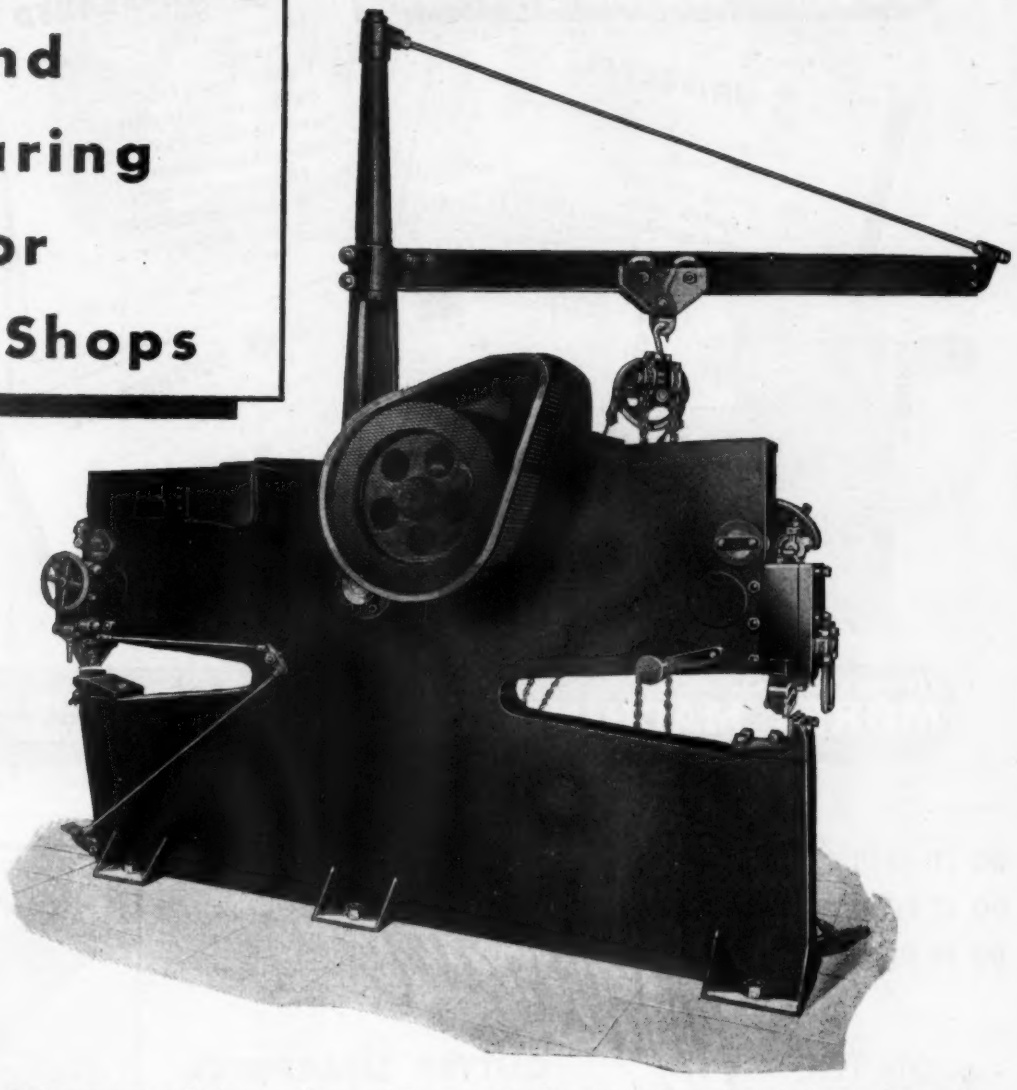
TOOLING FOR SPEED AND ACCURACY

● Hecker has the men, equipment and ability to help solve any tooling problem regardless of its size. In the past fourteen years we have helped to tool up practically every type of American Industry. For full information regarding Hecker engineering and tool building service write for our new brochure "Men and Machines".



A.W. HECKER
ENGINEERS *and Tool Makers*
Established 1931
1968 E. 66th ST., CLEVELAND 3, OHIO • OFFICES IN PRINCIPAL CITIES

Faster Punching and Shearing for Plate Shops



Does your plate shop enjoy the lower costs which come from quick, accurate shearing and punching? If not, the machine shown above is probably what you need.

Buffalo Double End Punches and Shears are made in eleven sizes with throat-depths ranging from 12" to 72". Plate shearing capacities start at 1/2"—go up to 2"; punch capacities range from 3/4" x 1/2" up to 2 5/8" x 2".

With special knives flats, rounds, squares, angles and tees can also be cut. Beams and channels can be punched. Triple punching attachment for plates, flats and angles can be supplied. A 90-degree notcher for angles, tees (flanges) and flanges of beams and channels can also be built into the machine above the punch. (Jib-crane shown above is furnished as an extra.)

If you are interested, tell us what size plates you cut and we'll be glad to recommend a machine of the proper capacity. Bulletin 304-F gives complete details of construction.

"Buffalo"

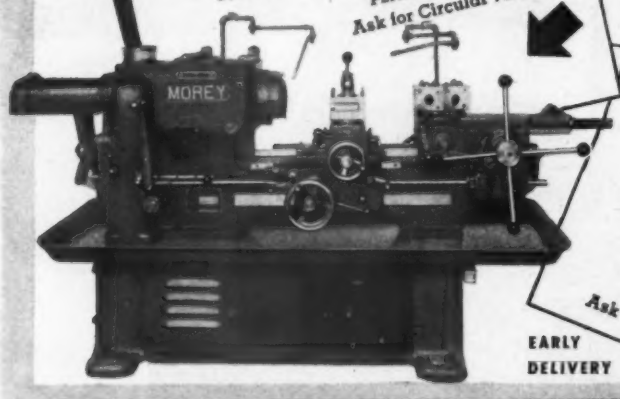
BUFFALO FORGE COMPANY
448 BROADWAY BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Double End PUNCH and SHEAR

MOREY TURRET LATHES
for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

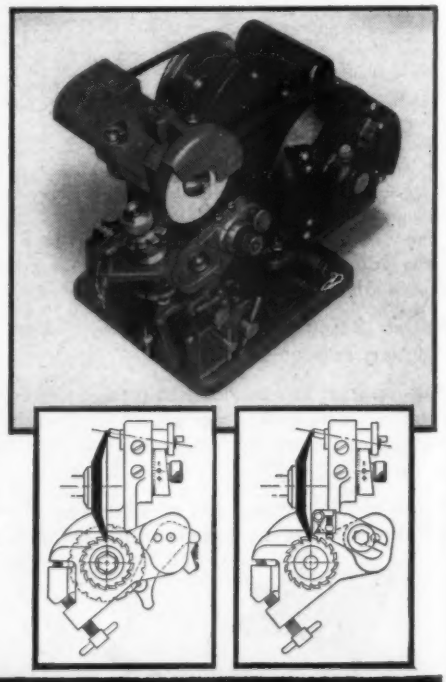
ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

DO IT EASILY
DO IT ECONOMICALLY
DO IT RIGHT

. . . ON THE *Waltham* CUTTER SHARPENER



The easiest, most economical way to sharpen small cutters is to use a machine designed for the job—a small machine—a Waltham Cutter Sharpener. This machine is *just right* for sharpening the face of gear or thread milling cutters, straight fluted hobs and multiple cutters not much over 2½ inches in diameter and ⅜ inches thick. The Waltham can be used for radial or rake grinding, and is available with index plates (left line drawing) or with a pawl locating attachment (right line drawing) for locating on the top or back of the teeth.

Don't tie up your big tool and cutter grinders on the small jobs—get a Waltham for utmost economy, speed and accuracy.

No machine is better than the cutting edge of the tool it uses

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

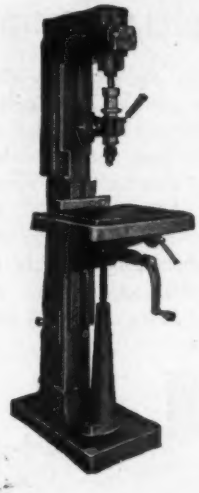
Please send me Bulletin No. 344 which gives full details on the Waltham Cutter Sharpener.

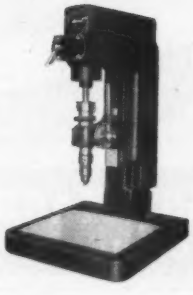
A.M.

Name..... Title.....
Company.....
Street.....
City..... State.....

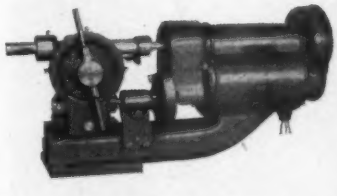
A HIGHLY DEVELOPED LINE...

Avey





MA 8—Eight speeds. 1200 to 12,000 R.P.M. Small work up to ⅜". Built-in motor. Bench and column types. 1 to 6 spindles.



Type B—No. 1, No. 2, No. 3 sizes. Hand feed drilling units. Hand feed tapping units. Power feed drilling units.

ONLY years of steady development can evolve the drilling equipment that is found in the Avey Line of Sensitive Drilling Machines.

The advances required in machining methods caused by the demands for greater output, necessitated more efficient drilling equipment. Avey Drilling Machines have steadily led the field.

Avey High Speed Sensitive Drilling Machines are built-in types and sizes to cope with varied needs. They are designed in capacities from the smallest drill gauge size to approximately 1¼ inches.

Being ball bearing throughout, they rate the highest speeds without vibration. This feature insures maintained accuracy.

The Avey Catalog details the line of Avey Drilling Machines and Drilling Machine Accessories.

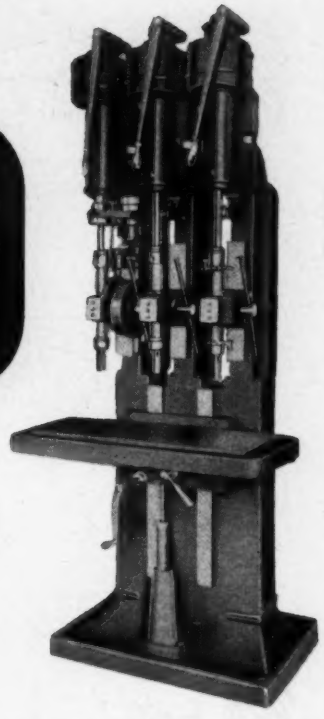
Avey Engineers will come to your aid in solving new and different drilling problems.

•

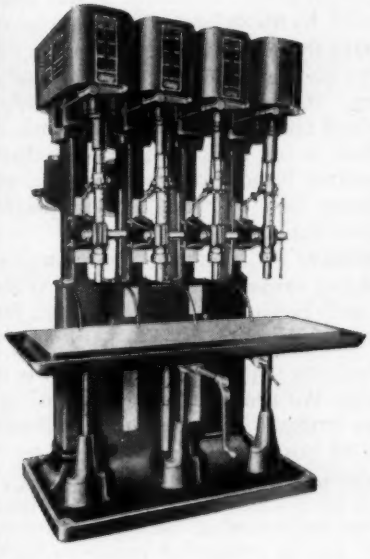
Individual Motors for each Spindle.

Single and Multiple Spindles.

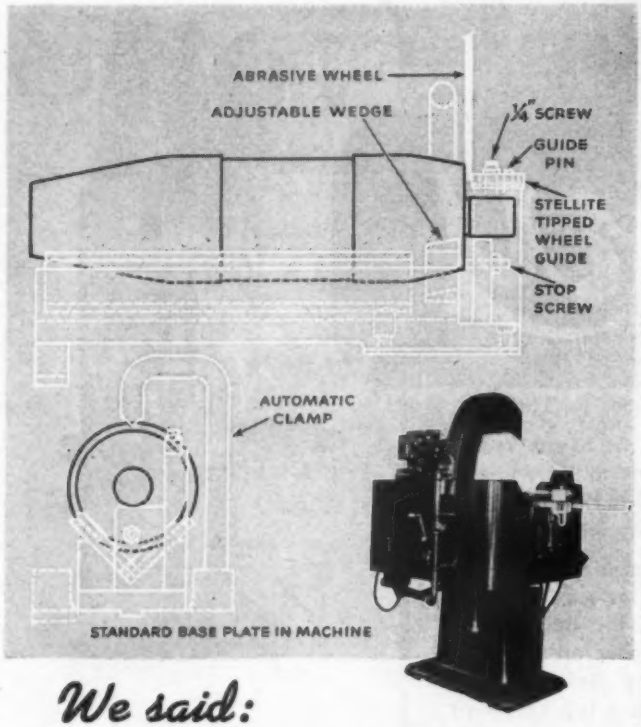
AVEY
DRILLING MACHINE CO.
CINCINNATI · OHIO



MA 6—Six speeds. No. 2 and No. 3 sizes. Built-in motors.



Belted quick speed change machine. No. 2 size. Four speeds. Standard frame motors.



We said:

"WHY NOT CUT IT ABRASIVELY?"

and here's what happened:

PROBLEM: To remove boss from closed end of shells. Conventional methods would require a second operation to finish end after removal of boss.

SOLUTION: CAMPBELL engineers recommended Model 213 Hydraulic with a simple fixture as shown in drawing. Facing tool makes undercut on boss to guide wheel through cut. Guide eliminates flutter in wheel. Shell is fed to work stop in fixture. Single hydraulic control handle operates clamp, and controls up and down feed of wheel. No special skill required by operator.

RESULT: Finished cut in one operation. Additional finishing operation eliminated. Wheel contact time for 1 inch boss—6 seconds. Fixture reduces handling time to a minimum. ★ ★ ★

Perhaps your cutting problem is not as simple as this one. We are constantly adapting CAMPBELL machines for unusual jobs—or to do ordinary jobs faster, better or at lower cost.

WHY NOT DO THIS? *Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information,* CAMPBELL *engineers can recommend production procedure and work up cost sheets for you.*

Campbell

ABRASIVE CUTTING MACHINES

ACCO

ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

ACCO TRADE MARK

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

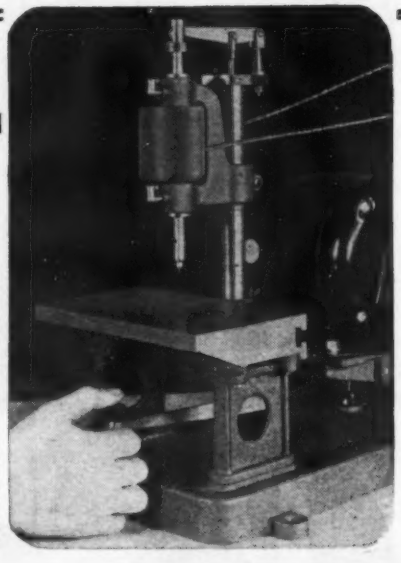
THE PORTAGE MACHINE CO.

AKRON 11, OHIO

LORD & DAVIS SUPER-SENSITIVE HIGH SPEED DRILL PRESS

. . . for the *most exacting* **PRODUCTION NEEDS**

Speeds from 3,000 to 23,000 R.P.M.



The extreme sensitivity of this modern machine results in minimized breakage of extremely small drills as well as suitability for use under the most rigid precision requirements.

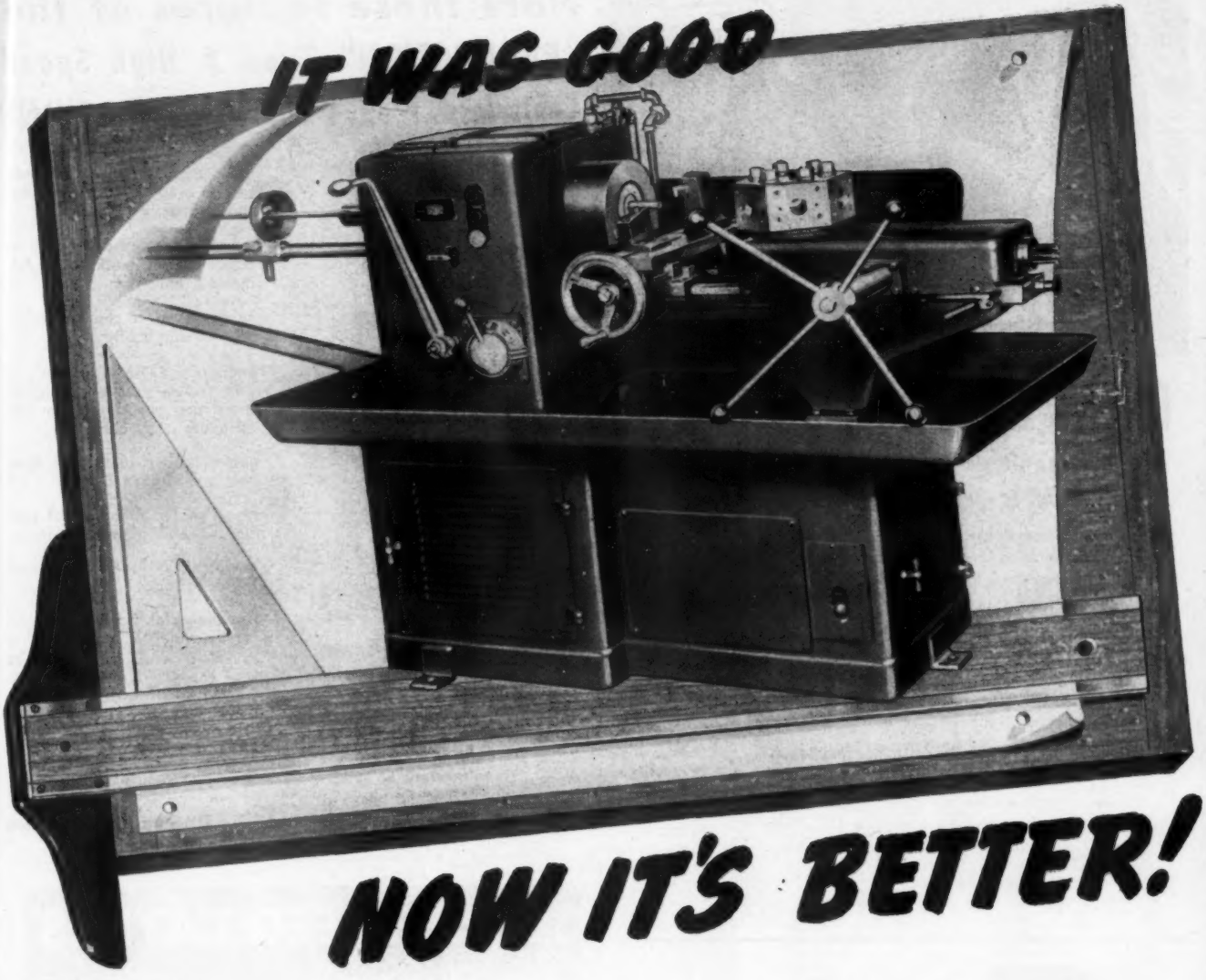
Proper surface speeds are attained by providing eight standard spindle speeds from 3,000 to 23,000 R.P.M. to cover all drill sizes from .004" to 1/16" diameter.

This machine is made with one, two, three or four spindles. On Multiple spindle units, each spindle may be run at an independent speed. Positive stops are available for all drilling spindles.

Write for Illustrated Bulletin, giving full details

MASSASOIT MACHINE CO.

220 GROVE ST., WALTHAM 54, MASS.



NOW IT'S BETTER!

Again, the Oster *SIMPLIFIED* No. 601 "RAPIDUCTION" lathe steps ahead with these additional developments:

1. New 4-speed motor permits four speed changes without change of sheaves. (2-speed motor optional.)

2. Motor is mounted on oil-resistant rubber to insure smooth, quiet operation.

3. Individual ⅛ H. P. motor now operates coolant pump to provide uniform flow of lubricant, independent of spindle speeds.

4. New electrical controls have speed selector switch located conveniently for the operator.

5. Increased rigidity of the machine is insured with longer base of heavier construction.

★ ★ ★

The Oster No. 601 "RAPIDUCTION" lathe is equipped with either WORM drive or DIRECT drive, as required. Other options include automatically indexed six-position turret or plain saddle. Capacity of machine: 1½" round bar. Ask your nearest Oster dealer or write us for complete details.

Inquiries are invited but deliveries are uncertain due to conditions beyond our control.

OSTER

"Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY • 2049 EAST 61ST STREET, CLEVELAND 3, OHIO, U. S. A.

GREAT SCOTT! MISS DINGLE

"We can't go on this way any longer! We've got to get more efficient production!"

It's not too early to start planning for more production at less cost. It will be too late to get the jump on a highly competitive market if your machines are outmoded by today's highly efficient equipment.

FENN SPECIAL MACHINERY

The prime duty of management is to see to it that machinery and equipment is operating at lowest possible costs; to junk obsolete equipment that has seen better days.

For three generations Fenn has been designing, developing and building machines to reduce production costs — all kinds, from printing presses to paper cup machines; as well as Tools, Dies, Jigs, and Fixtures.

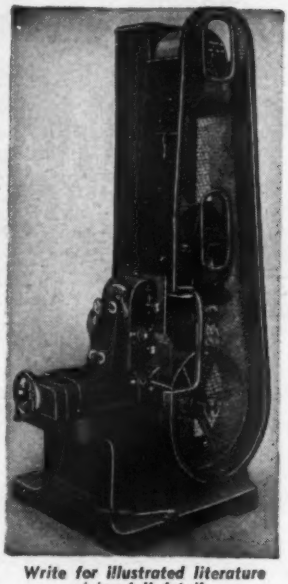
Fenn Engineers can help you when you decide to do something about better machines for more efficient production.

- TOOLS
- FIXTURES
- MACHINE PARTS
- SPUR GEARS
- INTERNAL GEARS
- GUN PARTS
- AIRCRAFT PARTS
- SUB-ASSEMBLIES
- QUICK ACTION VISES
- SPECIAL MACHINERY

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

Special Machinery For Efficient Production

Note these features of the "PRODUCTION" Type A High Speed Centerless Feed POLISHING MACHINE



Write for illustrated literature giving full details.

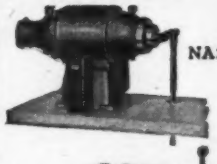
- . . . with power feed attachment, can be used for finishing tubes and cylindrical pieces
- . . . adapted to a wide variety of materials and work, both cylindrical and flat
- . . . no centering or chucking—just feed automatically
- . . . employs Duplex System of Two Belts — assuring highest speed and superior finish with adequate chip clearance
- . . . automatic belt tension for abrasive and cushion belts
- . . . provision for alignment of both cushion and abrasive belts
- . . . equipped with Timken Taper Roller Bearings
- . . . new powerful feeding unit assures accurate work and is provided with regulation of feed speed

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

IDEAL SPEED LATHES

For accurate, uniform, speedy finishing of metal & plastic parts.

AWARDED October '42



NA1E

NA1C

VA1B

POLISH • LAP • DE-BURR • FINISH

NA1B (above)–for general finishing of gears, pulleys, dies, and other large pieces – metal or plastic.

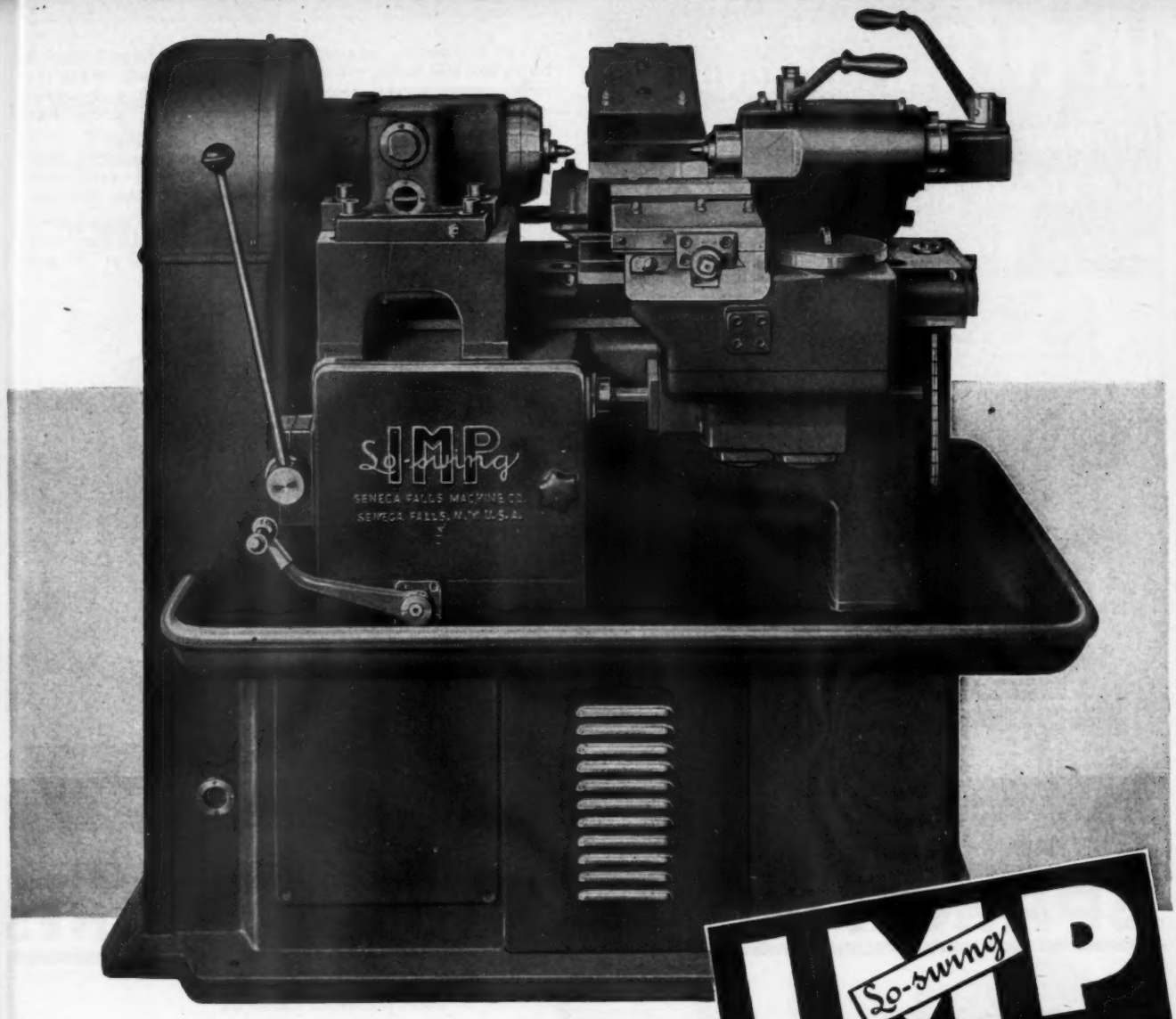
NA1E – foot-operated collet type, for high-production finishing of many identical small parts.

NA1C – with hand- or foot-operated collet, to take up to 1" round stock.

VA1B – variable speed lathes, in bench and pedestal models, chuck and collet types.

If you have a finishing problem WRITE FOR CATALOG 440

SCHAUER MACHINE COMPANY
ORIGINATORS OF TODAY'S SPEED LATHES
2060 READING ROAD ····· CINCINNATI 2, OHIO



IMP Lo-swing

For High Speed Accuracy

● For small work demanding high speeds, fine finishes and extreme accuracy, the fully-automatic IMP has earned an enviable reputation. Its sturdy, compact design makes it likewise suitable for turning heavier work such as small pistons, bushings, gear blanks, etc.

Because of its integral unit design, the Lo-swing IMP lends itself to practically unlimited tooling possibilities. A Third Slide or Over-arm is available for additional facing, grooving and chamfering operations—either roughing or finishing.

Write today for Bulletin N-42, fully describing this versatile lathe.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

. . . with

- ★ **SIMPLIFIED CHANGE-OVER MECHANISM.**
- ★ **SMOOTH, HIGH-SPEED DRIVE THRU MULTIPLE "V" BELTS.**
- ★ **SPINDLE MOUNTED ON SELECTED PRECISION BALL-BEARINGS FOR SPEEDS UP TO 5000 R. P. M.**
- ★ **FINE FEEDS FOR DIAMOND TURNING.**
- ★ **UNIQUE HEAD AND TAIL-STOCK DESIGN PERMITS CARRIAGE SLIDE TO PASS BY.**
- ★ **MANY FEATURES THAT REDUCE SET-UP TIME.**

LATHE NEWS from SENECA FALLS

HOEFER *Designs* SPECIAL EQUIPMENT

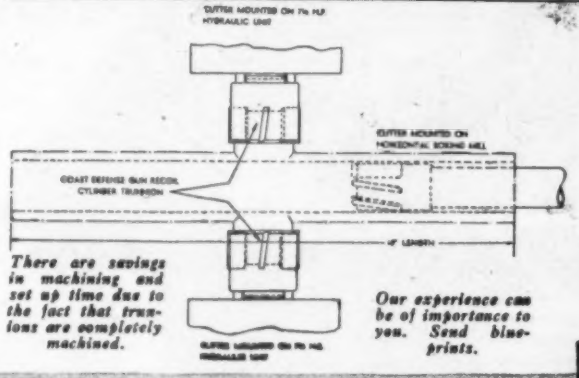
for machining a COAST DEFENSE GUN RECOIL MECHANISM CYLINDER with turning trunions . . . . . .

• This cylinder was mounted on the table of a large horizontal boring machine boring a 6-inch hole, 60 inches long. While the boring operation takes place there are two 7½ h. p. hydraulic units which turn and face the mean diameters of the true trunions.

The 7½ h. p. hydraulic units are equipped with special control valves to give rapid traverse forward—feed forward—dual return feed—return rapid traverse. Complete cycles in either direction.

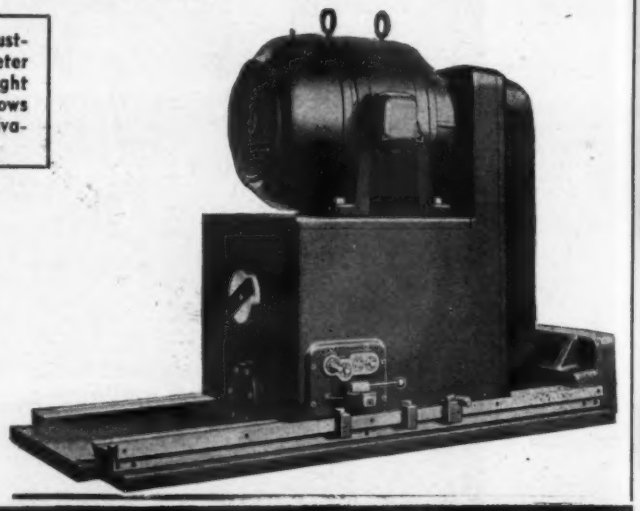
Control is provided so that hydraulic circuit can be disconnected and a feed screw on the machine base engaged. Two dials enable the unit to be moved mechanically either .010 or .001 per division on the dial.

7½ HP Unit for special purpose to cover a micrometer adjustment for a hand facing operation. When using the micrometer attachment, the ball lever shown on the gear box lower right corner, engages the screw which engagement automatically throws out the hydraulic circuit. In other words, each method of motivation is entirely independent of the other.



There are savings in machining and set up time due to the fact that trunions are completely machined.

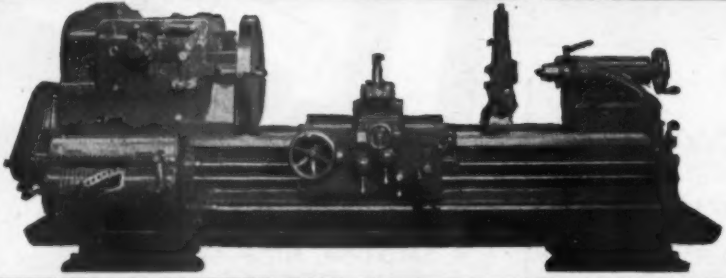
Our experience can be of importance to you. Send blueprints.



Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U.S.A.

ARMY E NAVY

Production INCREASED OVER 9 times...

Automatic machine cycle is controlled from push button station.

SUNDSTRAND RIGIDMILS WITH NEW TOOLING METHODS SIMPLIFY MILLING WING SPARS

These unusual milling operations were formerly done on universal milling machines. Highly skilled operators were required. Tedious, time consuming set-ups and trial cuts were necessary on each part to insure proper angles, depth of cut, etc.

Here's how the engineers at Boeing Aircraft, in collaboration with Sundstrand engineers, simplified the operations and increased production.

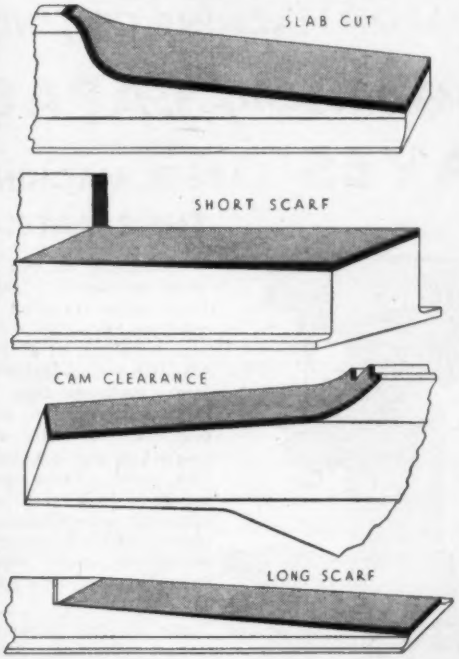
FIXTURES AND TOOLING INSURE ACCURACY ON 40 DIFFERENT OPERATIONS

Fixtures designed for approximately forty different operations make it possible to locate the work securely and accurately . . . eliminates trial cuts. The machine cycles automatically and stops at completion of the cut. Production time for the forty operations average approximately one-tenth of the old method.

As indicated in this milling problem solution, Sundstrand engineers are more than machine designers. Having had wide experience on milling problems, for low, moderate and high production, makes it possible for them to suggest changes which will provide the most economical *milling method*. They are at your service without obligation and we invite you to use this service freely.

Typical Operations

Both slab milling and face milling operations are performed on the wing spars. The slab and cam clearance cuts are cam controlled. Scarf cuts are face milling operations.



Free Data

on Fast Machines and Fast Methods are covered in these four booklets. Each covers a standard Sundstrand Rigidmil, complete with specifications and typical production milling solutions. Write for your copies today. Ask for bulletins 136.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

ARMY (E) NAVY

SUNDSTRAND

MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U. S. A.

FUEL UNITS • HYDRAULIC PUMPS • TRANSMISSIONS • FLUID MOTORS • VALVES and CONTROLS

If it's a small part, turn it with Precision, Speed and Profit on a

SHELDON LATHE

Model 5-36
10" Precision Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine

BUILDERS of GOOD LATHES since 1919

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U.S. Army, the Navy and the Marine Corps, for mechanized machine shops, instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Heavy Bronze bearings
- 1" Collet capacity
- 11¼-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All Steel Bench

SHELDON MACHINE CO., INC., 4234 N. KNOX AVE., CHICAGO 41, U. S. A.

Surprising **CAPACITY SAVES LARGER MACHINES FOR THEIR RATED WORK**

The Linley Miller and Jig Borer is a small machine . . . only 2½ sq. ft. floor space required . . . but its generous table size . . . 7" x 17½" . . . handles a lot of small jobs that too often are scheduled wastefully on larger machines. Dies, jigs, models, metal patterns, etc., are accurately produced, one after another, with easy set-up and fast changeover . . . with profit. There are 8 spindle speeds to 4250 r.p.m.; grease-sealed bearings; counterbalanced quill to remove backlash; direct micrometer setting to prevent figuring errors. Rugged, compact design for rigidity and "velvet" feed.

These are the features your toolmakers will like. Initial cost is reasonable, maintenance low. The Linley will quickly return your investment and prevent the small jobs from bottlenecking your shop.

ASK FOR BULLETIN.

LINLEY
BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

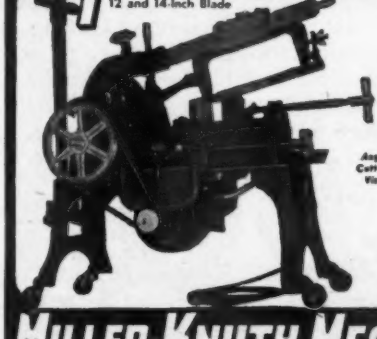
Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

POWER HACK SAW

12 and 14-Inch Blade

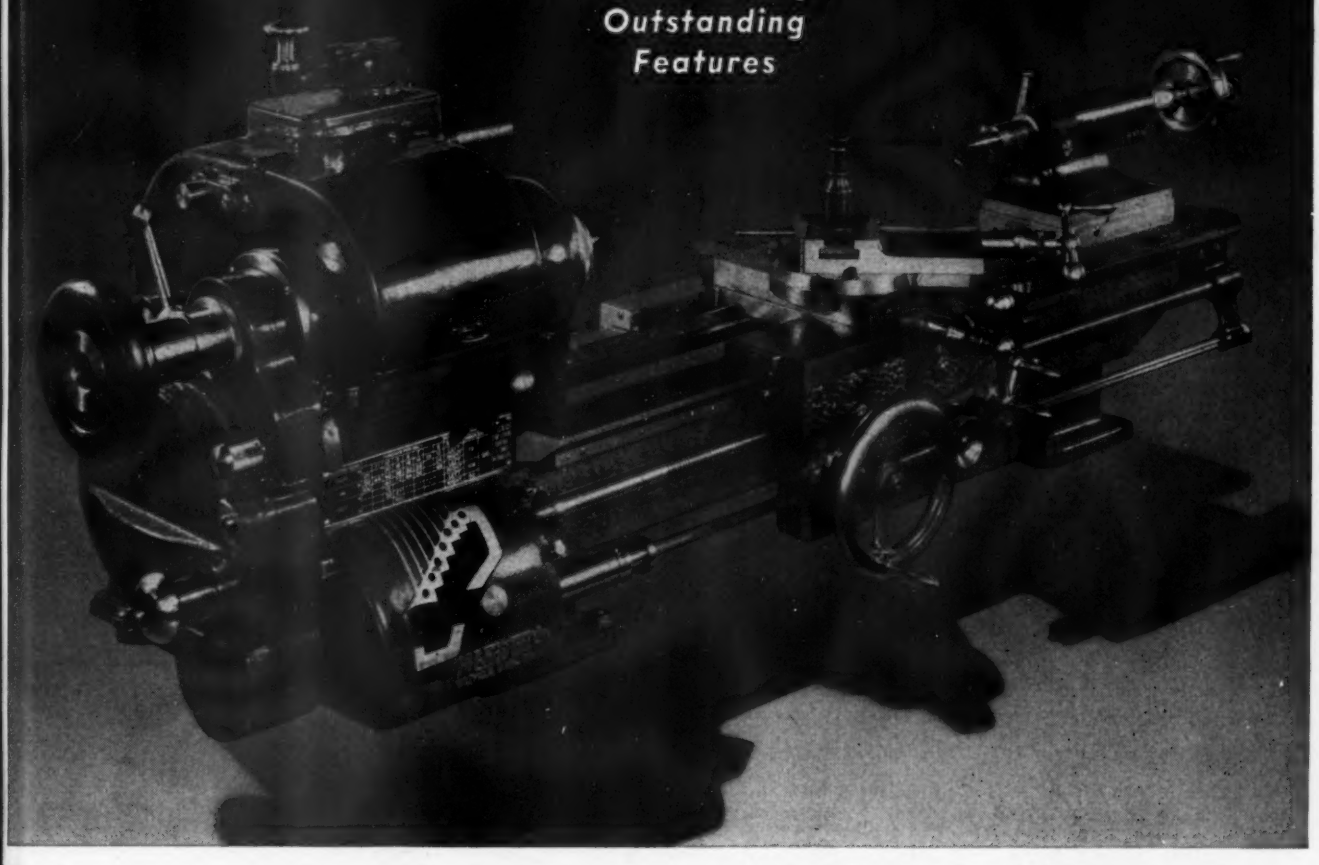


LOW PRICED
•
PORTABLE
SELF-CONTAINED
•
READY TO WORK
STURDY
ECONOMICAL
Write for Bulletin No. 100

MILLER-KNUTH MFG. CO. OMAHA, NEB.

It Will Pay You To Check Up On This WADE TOOLMAKERS' PRECISION LATHE

It Has Many Outstanding Features



Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

This No. 8-A Wade Toolmakers' Precision Lathe will meet your every requirement as to precision, versatility and stamina . . . for it is a carefully built lathe with many important features. The spindle has a 1" collet capacity, and is supported in a double row roller bearing, close to the nose. Thrust is taken on a precision ball bearing. The bed is 44", with 8½" swing. It is built on the correct principle of narrow guideways with broad wearing surfaces; it has lasting accuracy and the ability to take the heaviest cuts. The rugged tailstock spindle always has a bearing the full length of the barrel, has a scale graduated in 1/16ths, and a micrometer dial. It has a quick change gear box, and cuts threads as coarse as 6 TPI. Exceptionally close tolerances are possible. ***Write today for catalog***

THE WADE TOOL COMPANY

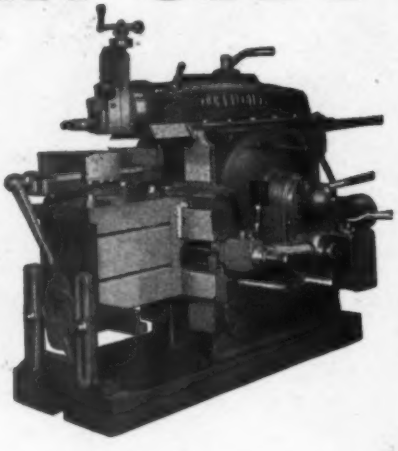
WALTHAM 54, MASSACHUSETTS

20% LOWER in COST

The

QUEEN CITY

SUPER TWENTY 20" Shaper



The new Queen City Super 20 Shaper offers advantages in price and performance no other Shaper of its type can equal.

A powerful, rugged machine, it is highly adaptable to both heavy production and a variety of tool room work. Many new operating features permit greater ease and convenience to improve quality while increasing production.

For top performance, speed, versatility, accuracy and unusual economy, the Super 20 will fulfil your highest requirements. Write for detailed literature.

The ram is of the V-type of wide bearing. Clutch is dry multiple-disc type. The feed range is extremely versatile—from .008" to .191", quickly and easily changed. A high torque motor for power rapid traverse is standard equipment. An electrical limit switch permits complete motor control. Timken bearings are used throughout.

AGENTS IN PRINCIPAL CITIES

QUEEN CITY MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

WRITE FOR LITERATURE

Sensationally Fast, Safe and Widely Applicable..

this method is rapidly displacing other cutting methods. Learn all about it and the machines that make it possible —

Tannewitz HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

KNIGHT — VERSATILE · ACCURATE · MILLERS · RIGID

FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

W. B. KNIGHT MACHINERY CO.
ST. LOUIS MISSOURI

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

GEARS TO ORDER

Spiral and helical gears; special couplings, bushings and collars; pins, pulleys and rollers. Made to your specifications—*promptly.*

KELLEY GEAR & TOOL CO.
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SLENDER, HIGH-PRECISION PARTS

★ FOR CLOCKS

★ INSTRUMENTS

★ BUSINESS MACHINES

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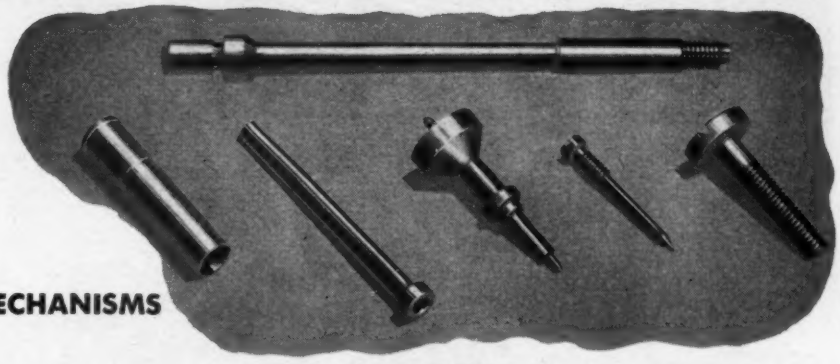
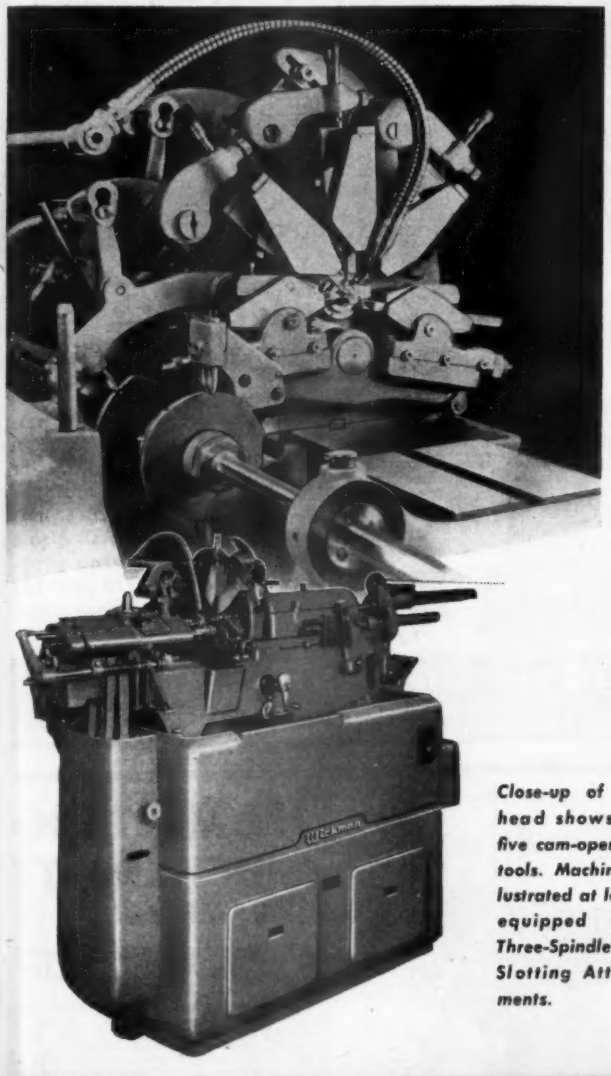


Are Produced *COMPLETE* on the Wickman No. 2

The Wickman No. 2 Automatic is designed especially for the production of small, slender parts to very close limits and with exceptionally high finish.

This machine turns pivot points and tapers of any angle, back shoulders, recesses and multiple diameters in a single operating cycle. Attachments provide for drilling, reaming, counterboring, threading, tapping, slotting, etc. simultaneous with the machine operations; so parts are produced *complete* without second operation.



Close-up of tool head shows the five cam-operated tools. Machine illustrated at left is equipped with Three-Spindle and Slotting Attachments.

The Wickman Automatic employs the Swiss principle of synchronized advance of the bar stock past five radially-operated single-point tools. The work is supported by a guide bushing very close to the tools — a major reason for the high finish and extreme precision obtained. Ample speed and rigidity permit full use of tungsten carbide tools.

SPECIFICATIONS: Capacity, ½" diam. Maximum turning length, 4". 28 spindle speeds, 1129 to 7057 r.p.m. Production cycles from 2 sec. to 4 min.

Illustrated bulletin giving full details available on request.

Wickman No. 2
SWISS TYPE

HIGH PRECISION AUTOMATIC

★

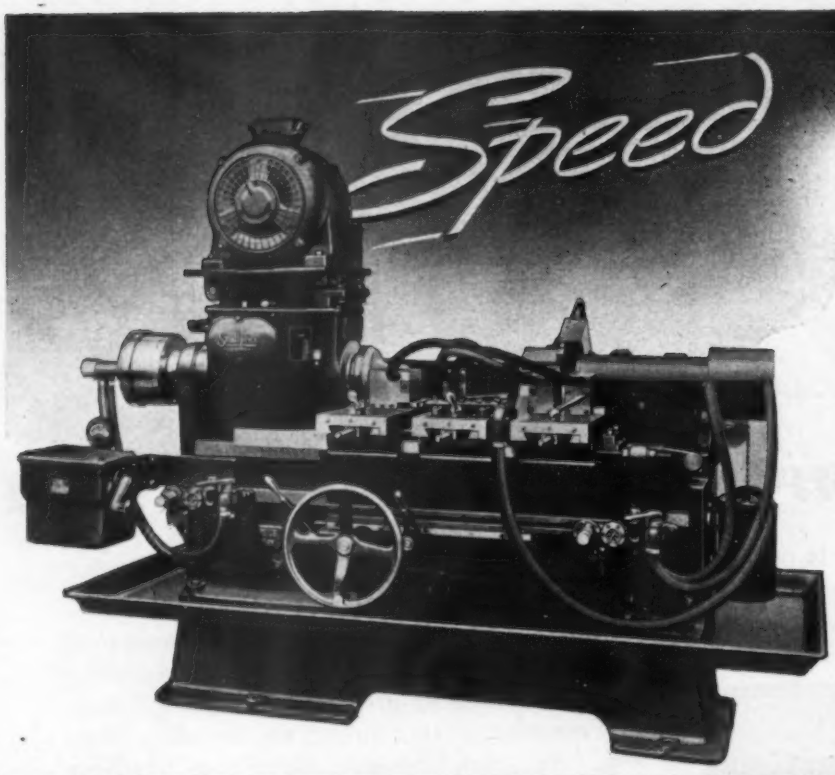
A similar Wickman machine of 5/32" capacity and 1-9/16" turning length is available for smaller work of even greater accuracy. Ask for bulletin on the Wickman No. 1.

THE Wickman CORPORATION

15539 WOODROW WILSON AVE., DETROIT 3, MICH.

A. C. Wickman (Canada), Ltd., P. O. Box 9, Station N, Toronto, Ontario

Branch Offices: 1060 Broad St., Newark 2, N. J. • National City Bank Bldg., Cleveland 14, Ohio • Civic Opera Bldg., Chicago 6, Ill.



SPELLS SUCCESS

The Smallpeice Production Lathe spells equal success for either peace or war manufacturing. It is the ideal production machine for every type of regular turning, boring, facing and profiling—with a versatility that means a fine investment.

For complete information write Smallpeice, Ltd., 505 Rantoul Street, Beverly, Massachusetts.

SMALLPEICE

MACHINE TOOLS AND EQUIPMENT • MANUFACTURED IN U.S.A. AND GREAT BRITAIN

ACCURACY at it's BEST!

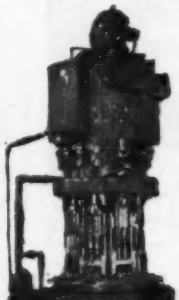
"To the Tenth!"

PIECE AFTER PIECE ...HUNDRED AFTER HUNDRED... ACCURACY AT IT'S BEST! REID GRINDERS ARE BUILT TO PRODUCE THAT RESULT...CLOSE TOOL ROOM WORK OR GANG-UP PRODUCTION ARE AT YOUR FINGER-TIPS ON

SURFACE **REID** GRINDERS

REID BROTHERS CO., INC. BEVERLY, MASS.

SEND FOR CATALOG AND PRICE LIST TODAY.



Vertical ROTO-MATICS

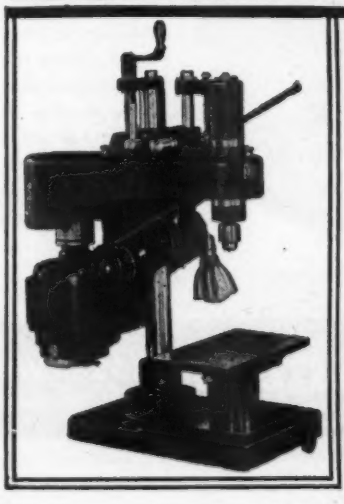
Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. Milwaukee 14, Wisconsin



HAMILTON-MUEHLMATT "VARIMATIC"

offers a wide range of super sensitive drilling speeds

The wide range of drilling speeds provided in the "Varimatic" makes it adaptable for the finest of tool room work, instrument, diesel, electrical, airplane and similar precision work. It is built to "instrument precision" and has a capacity for drills from .004" to 5/16" inclusive. Speed Ranges as follows—Low Range—Minimum 840—Maximum 2700—High Range—Minimum 2900—Maximum 9300. Write for details.

The Hamilton Tool Co.

HAMILTON OHIO

Stop Wear, Rust and Corrosion with this

BODY-GUARD FOR BALL BEARING!

THROUGHOUT your busy plant, there are hundreds, perhaps thousands, of grease-lubricated ball bearings like the one shown at the right.

As you know, their efficient operation depends largely upon a grease that continuously covers the highly polished surfaces and provides strong films for protection against wear, rust and corrosion. At the same time, this lubricant must seal out impurities, minimize leakage, make frequent re-packings unnecessary.

Today, in thousands of U. S. plants, Gargoyle Greases BRB, are providing this maximum protection. They are outstanding for their stable structure and their resistance to oxidation and separation over long periods in service.

Get Gargoyle Greases BRB, and be sure your ball bearings have the best body-guards you can buy.

SOCONY-VACUUM OIL CO., INC.
Standard Oil of N.Y. Div. · White Star Div. · Lubrite Div. · Chicago Div. · White Eagle Div. · Wadhams Div. · Magnolia Petroleum Co. · General Petroleum Corp. of Calif.

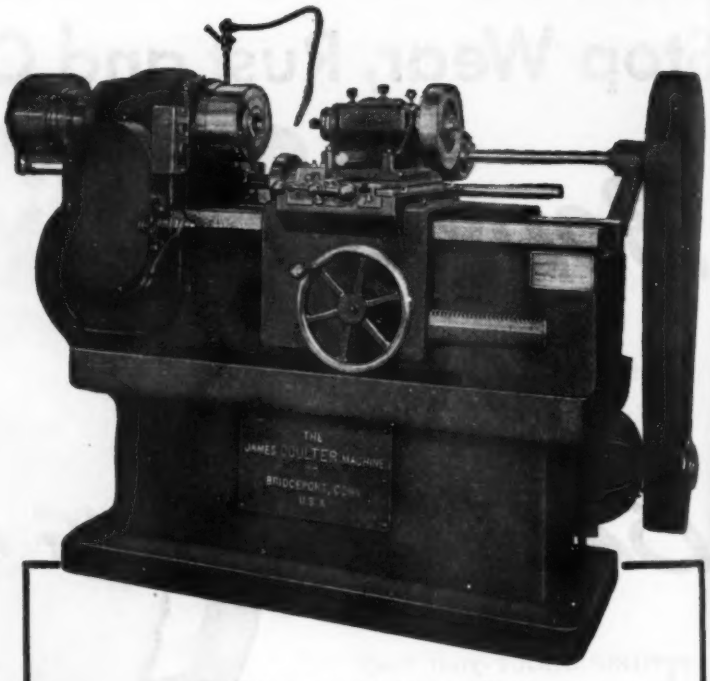
CALL IN SOCONY-VACUUM FOR "CORRECT LUBRICATION"

GARGOYLE Lubricants

Socony-Vacuum's **5 STEPS** to Lower Production Costs for You!

1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
3. Lubricant Storage and Handling System
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

GRAND RAPIDS NO. 60
UNIVERSAL CUTTER AND TOOL GRINDER

featuring:

- modern cabinet base
- hardened and ground table ways
- ball bearing table
- fixed table height
- one shot lubrication
- and many other important features.

Illustrated Catalog containing complete details sent promptly on request.

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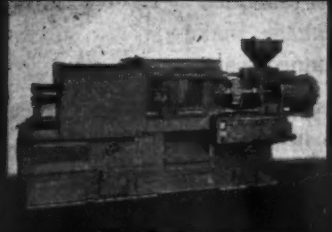

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THE NEW WIDE-SPACED HARD TOOTH SAW

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Spindle—Chrome nickel steel National Standard taper hole #50
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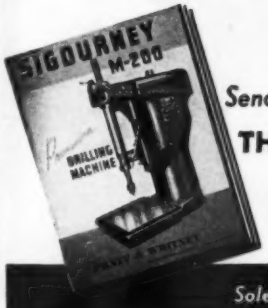

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The Modern Way

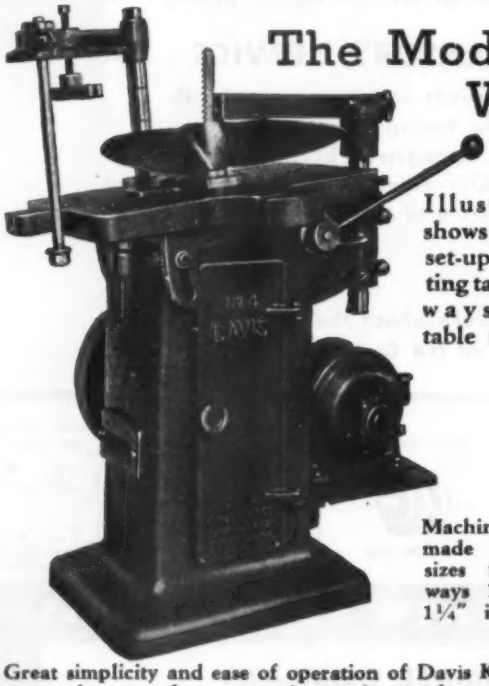

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

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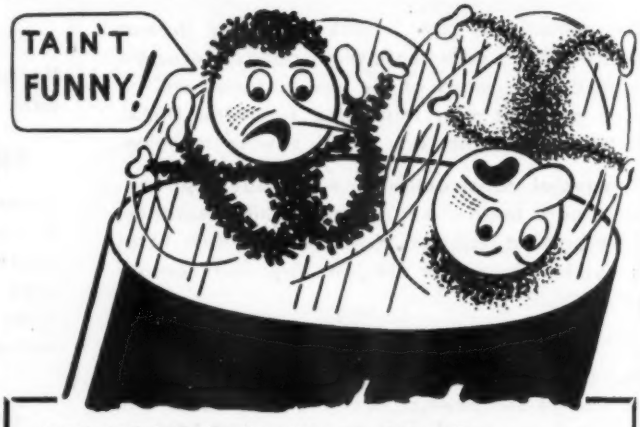

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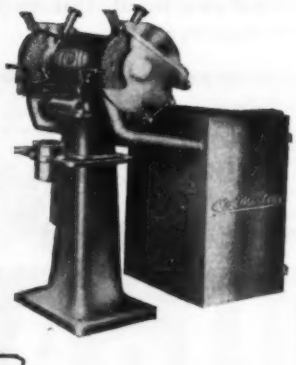

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Warcolube is an anti-galling compound having exceptional film strength. Not only has it proved itself a superior lubricant for lathe and grinder centers but also for such special applications as binder pins, drive fits and for many other close tolerance assemblies.

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A generous test sample of Warcolube will be sent to you free on request. If you have a specialized operation that requires an absolutely non-failing lubricant we suggest that you ask for Warcolube immediately.

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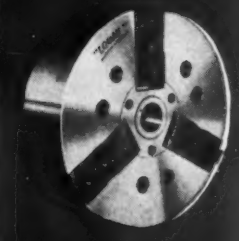
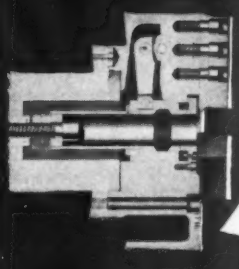
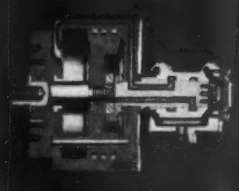
5 ways

Logan Hydraulic-Operated Chuck *Reduces Machining Costs* on Libby Heavy-Duty Turret Lathe







1 Reduces Chucking Time to Seconds
2 Eliminates Rejects and Spoilage
3 Maintains Accuracy and Finish
4 Reduces Idle Machine Time
5 Minimizes Operator Fatigue

• A standard Logan hydraulic-operated chuck—together with complete Logan hydraulic equipment—permits important savings in machining cost per piece on this Libby heavy-duty turret lathe application. Chuck jaws are opened and closed *in seconds* by simply moving the lever of the conveniently located control valve. This reduces chucking time per piece, saves operator time and machine time, and minimizes operator fatigue. As a result, production is profitably increased.

Constant, equalized pressure of the jaws prevents distortion of the work and automatically compensates for any loosening effect. Overhang is minimized in the Logan chuck, providing the rigidity which means improved accuracy and finish.

All elements of the complete hydraulic chucking system on this job are standard items in the Logan line—3-jaw universal chuck, hydraulic power unit with built-in relief valve, pressure gauge, rotating hydraulic cylinder and control valve.

Air-operated chucks, controls and accessories are also available. Logan hydraulic and air-operated chucks come in a wide range of standard sizes and types. Special chucks can also be supplied for unusual chucking applications.

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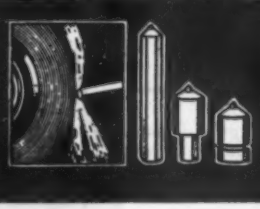

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A Speedier, Error-Proof Operator! No human operator could possibly turn the two feeds on this vertical lathe to form-turn this ordnance part at required speeds of production and at the limits demanded. Yet DUPLIMATIC does it—easily, accurately, at speeds exceeding original specifications. The DUPLIMATIC automatically turns 1, 2 or 3 feed screws simultaneously!

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Planning for Peace-Time Conversion? The single, dual or 3-dimensional special DUPLIMATIC will step up your production machining with unerring accuracy and with less skilled help —to supply the pace that postwar competition will demand.

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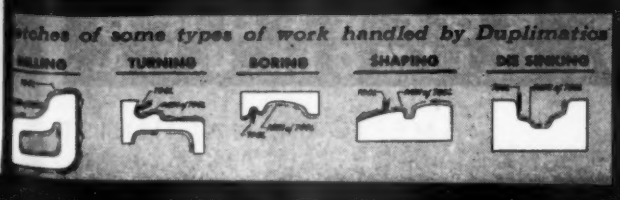
We have data available on production operations that cannot be published generally. Write, stating type of work you do. Send print, sketch or sample, if specific information is desired.

Sketches of some types of work handled by Duplimatics



DETROIT UNIVERSAL DUPLICATOR COMPANY

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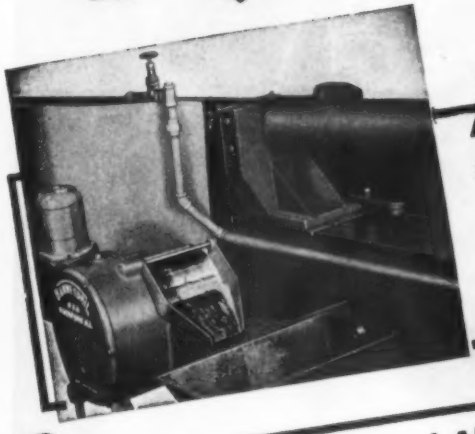
4 Reasons

WHY THE BARNESDRIL *Magnetic-Automatic* COOLANT SEPARATOR

Offers the Ideal Method for Cleaning Honing and Grinding Coolants



1 Entirely Automatic Operation

Swarf and magnetic particles are automatically removed from honing and grinding coolants having a non-soluble base, through magnetic attraction, by the new BARNESDRIL Separator. Continuous or intermittent operation is easily achieved with little attention from the operator, who simply starts or stops the Separator motor as desired.

(Left) Installation view of a BARNESDRIL *No. 2 Magnetic-Automatic Separator attached to a large horizontal honing machine.*

2 All Harmful Metal and Abrasive Particles Removed

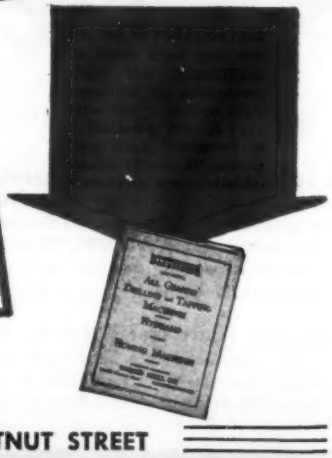
The danger of marring or scratching finished work is minimized by use of the BARNESDRIL Separator, since all metal chips and coarse, abrasive particles are removed from the coolant as it flows rapidly through the lower part of the Separator on its way to the reservoir for recycling. As a result, finished workpieces are seldom rejected.

(Right) Close-up view of BARNESDRIL *No. 2 Separator in operation, showing swarf being scraped off at discharge station.*

3 Low Initial and Maintenance Costs

Time formerly spent cleaning and changing filters of costly filtering equipment is saved through use of the BARNESDRIL Magnetic-Automatic Separator as there are no filters employed. Thus, maintenance costs are substantially reduced, for the operator can devote full time to productive work.

(Left) BARNESDRIL *No. 2 Separator attached to a Surface Grinder. Height of grinder is great enough to permit gravity flow of coolant into Separator.*



4 Simple Installation . . . Carefree Operation

The BARNESDRIL Magnetic-Automatic Coolant Separator is easy to install on any type of honing machine and many types of cylindrical grinders. Carefree operation is assured; as the magnetic rotary drum turns, the accumulated swarf and metal particles are scraped off and carried through an inclined chute to a removable pan.

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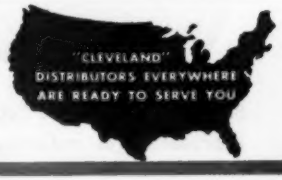

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With cemented carbide on the extremely "critical" list, you've got to get the most out of every tool. More reason than ever to use TECO Cemented Carbide . . . the carbide that stays on the job longer, produces more pieces, remains highly productive for the full life of the tool.

PROVE IT YOURSELF! Put TECO Cemented Carbide on any machine in place of present carbide tools. Run exactly as before—then compare the extra production with former results.

TECO Cemented Carbide is extremely hard, tough and uniform—resists wear and breakage beyond any other carbide. And because it does a lot more work, it costs much less to use. Make your on-the-job comparison now. Have one of our tool engineers discuss your needs—or send details of your operation. Catalog and price list sent on request.

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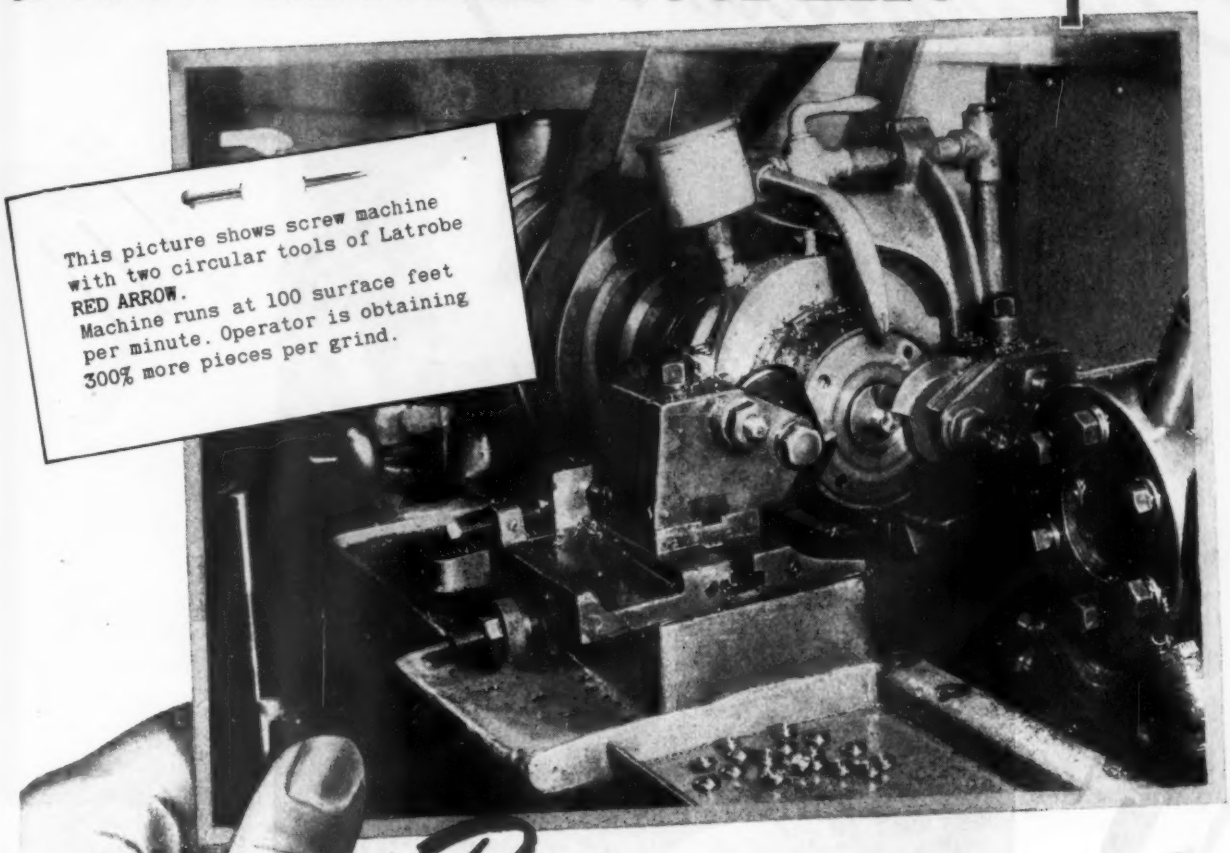
CEMENTED CARBIDE
Pioneers in Tungsten Carbides for over a Quarter Century

Screw Machine Tool Life Up 300%


This picture shows screw machine with two circular tools of Latrobe RED ARROW.
Machine runs at 100 surface feet per minute. Operator is obtaining 300% more pieces per grind.

Production records like this are not unusual with...

LATROBE

RED ARROW

The Superior Cast Alloy *-for metal cutting tools*

1—Requires no heat treatment

2—Ground with ordinary wheels

3—Available in square, round and rectangular tool bits, cut-off blades and tips

Screw machine operators appreciate Latrobe RED ARROW, because it provides long runs between grinds, thus minimizing production delays and effecting greater economies in operation.

Latrobe RED ARROW is the answer to most screw machine tool problems, not only speeding urgent output but actually improving the appearance and quality of the product. It has been proved in every type of screw machine operation, as the *superior cast alloy.* Write for further information.

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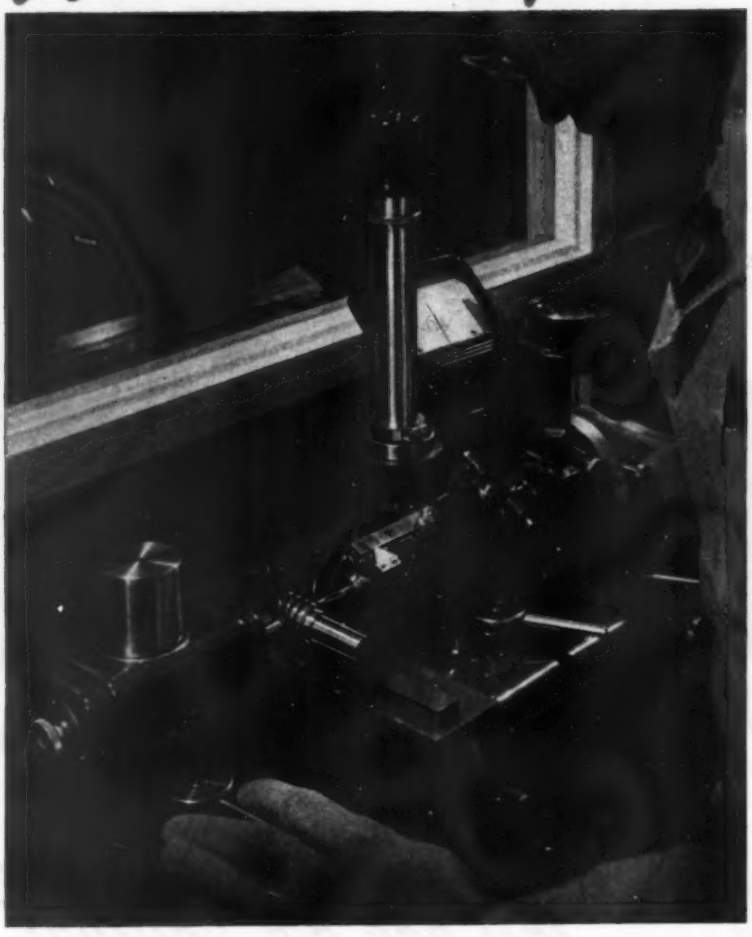
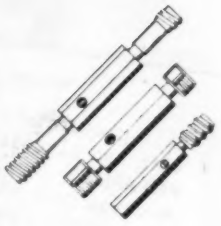
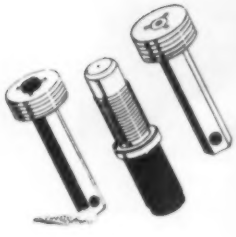






Control Kobe Gage Quality

As a gage user, your prime interest is in the finished product. Kobe Gages are today serving in some of the most exacting operations of the war effort. Such things don't "just happen."

Contributing to the high standards of quality characterizing Kobe Master and Reference Gages are the materials, the workmanship and precise engineering which go into their construction. Nowhere will you find better trained personnel or more modern manufacturing and checking equipment than is maintained in Kobe plants.

Kobe's motto has always been "Not how much, but how well." That's why Kobe Gages are known as a standard of quality wherever precision checks are required. That's why you will find Kobe Master and Reference Gages—in war plants, with the armed forces and generally wherever high gage quality is required.

Kobe's care in manufacture, selection of materials and their engineering of gages is directed today along the lines of wartime use. From this experience will come obvious benefits to be passed on to peacetime industries. That's why when Kobe is again in a position to manufacture gages for general industry you will want to think of KOBE.

KOBE

ONE OF THE DRESSER INDUSTRIES

Master and Reference GAGES

KOBE, INCORPORATED

3040 East Slauson Avenue • Huntington Park, California

You can't find it all in books!

GRINDING has become an exact science. And so, much of the standard information users of abrasives need to specify the right abrasive for the job *can* be found in the books—notably "GRINDING FACTS" by "CARBORUNDUM." Nevertheless, industrial grinding techniques advance so fast these days, the books can't quite keep up. If you have an abrasive problem that cannot be solved by the standard pattern, call a "CARBORUNDUM" Representative. He has access to the latest information from other users and from the "CARBORUNDUM" laboratories.

And there are always the "CARBORUNDUM" Abrasive Engineers. These are the men who know abrasives and their uses from the inside out. They have helped originate many of the present-day standard grinding techniques. They can sit right down with you at the planning stage and help you work out your problems from the start, as they have done for many manufacturers. For the solution to all your abrasive problems consult your "CARBORUNDUM" Representative. He will be glad to be of service. Write to The Carborundum Company, Niagara Falls, New York.

THERE IS A PRODUCT BY

CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer

Barrett Centrifugal Washer — made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 258 Jan. 18, '45, American Machinist

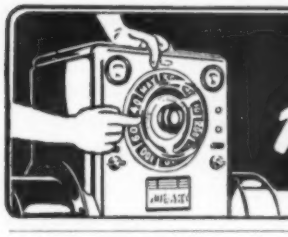
THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

HOLMAN *BETTER, FASTER HOLE FINISHING*

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.



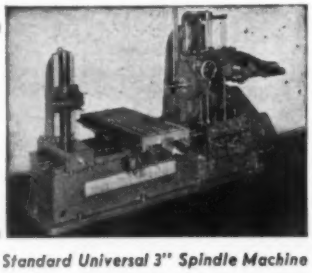
HOBART "Simplified" ARC WELDERS

WRITE for your copy of New Catalog

HOBART BROTHERS CO., Box A.M. 5-24 TROY, OHIO *"One of the World's Largest Builders of Arc Welders"*

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

LITTELL POWER-TILT REEL—Automatically Lifts Coils from Floor—Saves Labor—Speeds Production

GIRL can load 250-lb. coil of wire without aid. Drop center for tilting coil on floor. Motor drive raises coil. Reel lowers and raises automatically.

Request bulletin

Littell Power-Tilt Reel. Handles coils to 250 lbs. Tilts by power to load.

F. J. LITTELL MACHINE CO.
4169 Ravenswood Avenue
CHICAGO 13, ILL.

575% MORE PIECES PER GRIND

T-R-I-P-L-E-D FEED AND SPEED

...WRITES THIS PROMINENT MOTOR MANUFACTURER

Vascoloy-Ramet Corporation
North Chicago,
Illinois

Attention: Sales Department

Gentlemen:

We were using High-Speed Steel Cutters on a Sundstrand Rigidmil, Machining Sandy Castings, 4340. We produced only 12 pieces per grind.

On the same job with a Tantung Shell End Mill we produced 69 pieces per grind. Feed and speed were tripled.

This was a troublesome job and Tantung is saving us time, money and headaches.

Under separate cover you will find our order for 12 Tantung Blue Streak Shell End Mills.

Very truly yours,

TANTUNG

"THE MIRACLE METAL"

Fills the gap between High-Speed Steel and Carbides. For heavier cuts, increased speeds and more pieces per grind. Use TANTUNG when you cannot use Carbide. Write for the free TANTUNG BOOK illustrating a list of standard tools for turning, boring and facing.

For prices and specifications on Tantung Blue Streak Shell End Mills, write for Bulletin 338.

FREE TOOL SELECTOR CHARTS See at a glance, Table of Speeds, Feeds and Tool Selection. Charts show when to use High-Speed Steel, Tantung or Carbides to best advantage. Advise how many WALL CHARTS and how many POCKET CHARTS your plant will need.

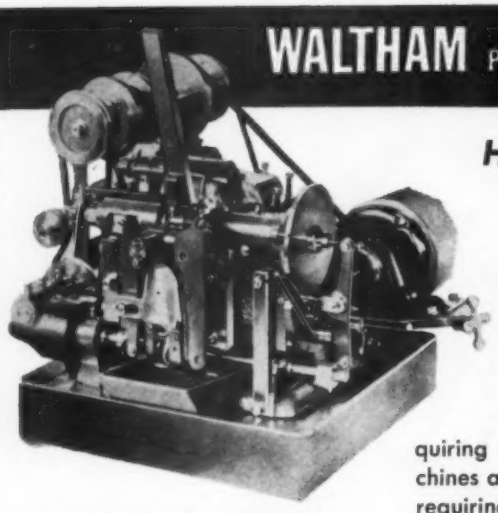
Ramet

VASCOLOY RAMET CORPORATION

4516

NORTH CHICAGO, ILLINOIS • SALES AND SERVICE IN PRINCIPAL CITIES

WALTHAM PINION & GEAR CUTTING MACHINES

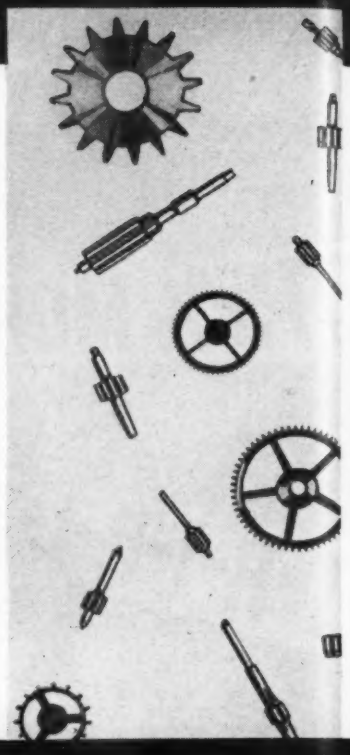


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S.PAT.OFF.

500% INCREASE *in Marking Production*

Greater unit speed provides a money-saving solution to many marking problems. This power-operated machine marks inscriptions permanently into metal products by the precision rolling process, combining speed with accuracy. Adjustable for varying sizes. Automatic safety devices and registration of numbering or marking. Automatic unloading. Investigate "Noble-west" marking equipment and discover new production economies.

The Noble & Westbrook Manufacturing Co.
"Specialists in Rapid, Precision Marking Equipment"
17 Westbrook Street East Hartford, Conn.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

Help yourself to faster, more economical operation

SEND FOR BULLETIN No. M-10

MODERN-MAGIC CHUCK
AND COLLET EQUIPMENT

Equip your multiple or single spindle machines, used for a sequence of operations, with MODERN-MAGIC Chucks and Collets, and step up your production. Idle time of revolving spindles is reduced to zero . . . tools can readily be changed while the machine is running. Single spindle machines are given practically multiple spindle range by these MODERN tools. They pay for themselves many times over in time saved. Full information upon request. Why not investigate today?

PROMPT SHIPMENT.... USUALLY FROM STOCK

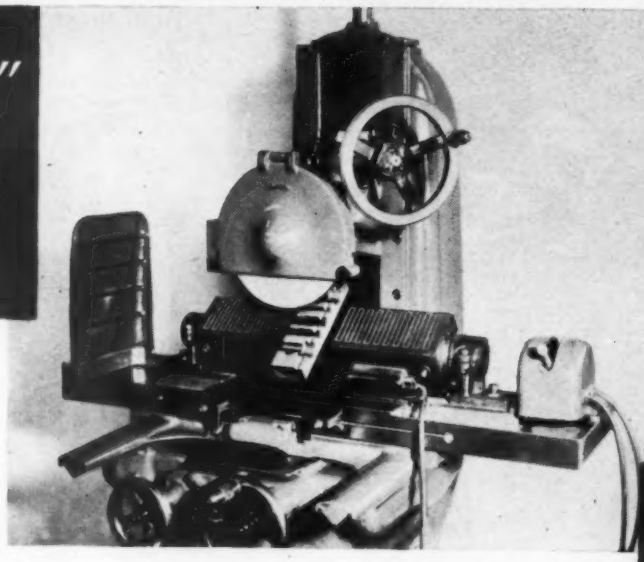
MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

"WALKERS" at work



Walker Swiveling Magnetic Chuck on an Abrasive Machine Tool Company's No. 1½ Surface Grinding Machine, the operation consisting of grinding angular surfaces.

Write for information on the Walker line which includes Magnetic Chucks of both Electro-Magnetic and Permanent Magnetic types.

One of a series of advertisements showing specific uses of Walker Magnetic Chucks on specific machines, and the operations involved.

Providing for Versatility in Tool Room Work

The combination of a Walker Magnetic Swivelling type Magnetic Chuck and a light hand feed machine of extreme accuracy is an ideal one for the modern tool room. Not only is highest quality of finish obtainable but a wide range of set-ups are made available, quickly and easily with positive assurance that work will be securely held and closest accuracy maintained at all times.

Whether for tool room or production grinding, machine tool builders recognize the benefits derived from using Walker Magnetic Chucks on their machines. Your builder can give you specific information or ask for our suggestions.

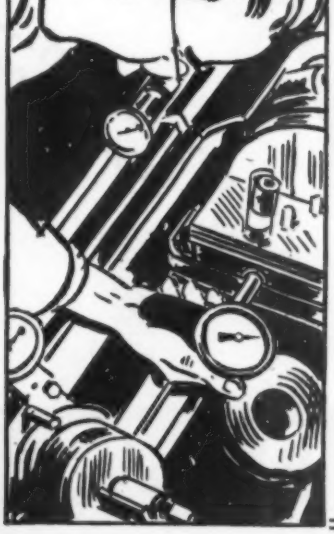
O. S. WALKER COMPANY INC.

201 ROCKDALE STREET
WORCESTER 6
MASSACHUSETTS

ANNOUNCING THE NEW

SHOCK-ABSORBING COMTORPLUG

Extra protection for heavy shop duty



Shock-absorbing construction is now standard on all Comtorplug amplifiers. As a result, this unique internal gage combines extreme accuracy with ruggedness almost unbelievable in a gage measuring to fractions of .0001". Already widely used by machine operators and bench inspectors, as well as final inspectors, the new amplifier is completely safeguarded against possible damage from the application of sudden or severe force by even the most careless and unskilled users. EXISTING MODELS OF PLASTIC AMPLIFIERS MAY BE CONVERTED TO THE SHOCK-ABSORBING TYPE AT REASONABLE COST.

Request Bulletin 31

THE COMTOR CO.
68 Rumford Avenue
Waltham, Mass.

Smooth Chatterless Operation

WITH

Clark

ADJUSTABLE FLY CUTTER

Two models cut quick, clean, accurate holes within a 2½" to 10" range, up to 1" thick. Cross-section of cut has appearance of letter "W" with each blade taking out its own side. Unique angles at which blades are held and new grinding technique on high-speed steel cutting blades prevent chatter. Shank is heat-treated. Removable pilot, hardened and ground, permits use of lead drills.

For complete information, call your Clark Cutter Jobber today, or write for Catalog A.M. 5-FC

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD BEVERLY HILLS CALIFORNIA

New Book on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

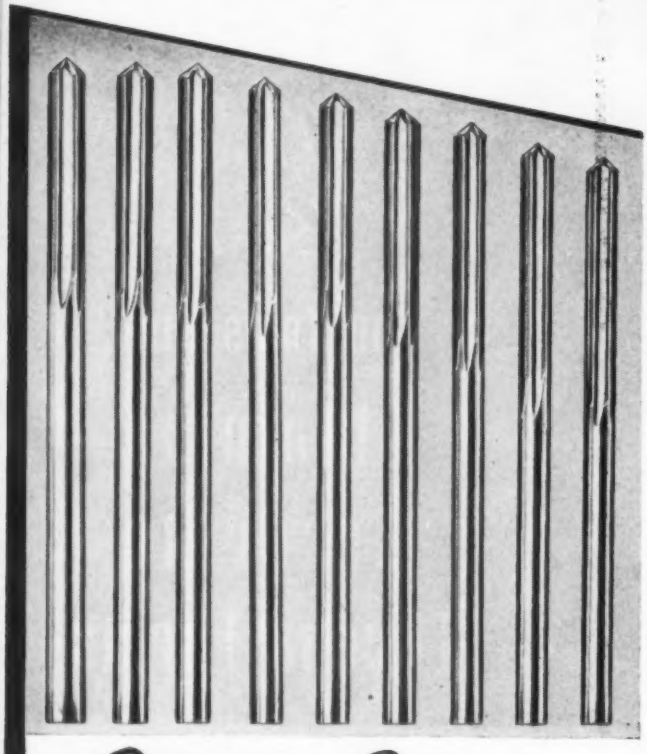
Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost per piece all are reduced accordingly.

These tools, which are made in types for dressing each specific form, are completely described and illustrated in a new booklet which we will be glad to send you on request. If you have thread grinding equipment, this booklet will point the way to substantial savings. Send for your copy.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada



Better Reamers are our Specialty

All the brains, all the skill, all the facilities at Lavallee & Ide are directed toward one aim — a better small reamer.

We're making it now in the L & I Ground Flute Reamer which is more accurate, smoother cutting, and longer lived by far than ordinary milled flute reamers, yet *costs no more.*

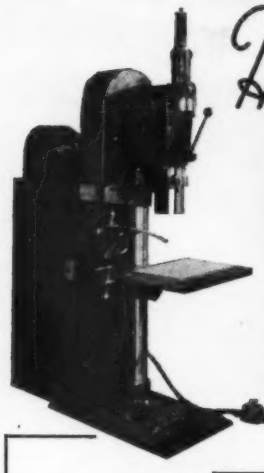
Grinding the flutes from solid, hardened, high-speed steel bars, and giving super-careful attention to the finish of the cutting surfaces are secrets of L & I superiority.

Because we specialize, we can deliver from stock fractional size Machine Reamers by 64's from $\frac{1}{16}$" to $\frac{8}{16}$", and wire gage sizes from 1 to 60, as well as Taper Pin Reamers from 7/0 to # 4.

Bring us your reamer problems. You'll get better results because we're "Specialists in Small Reamers."

LAVALLEE & IDE, INC.
CHICOPEE, MASSACHUSETTS

L&I GROUND FLUTE REAMERS



Here's a valuable guide for

PRODUCTION TAPPING

Anyone responsible for high speed, accurate tapping should have this pocketsize pamphlet. It contains a lot of useful data on tapping — such as suggested speeds in various metals—suggested lubricants for different metals—how to find spindle speed for tapping — table of spindle speeds—basic thread dimensions and tap drill sizes—and many other useful hints for high speed low cost tapping.

Also the advantages of the Cleveland lead screw controlled tapping machine.

Above, Model D Cleveland Precision Tapping Machine

Write for your copy today.

THE CLEVELAND TAPPING MACHINE CO.
3610 Superior Avenue • Cleveland 14, Ohio

The RANDALL & STICKNEY Platform Gauge

. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

RANDALL & STICKNEY
Waltham 54, Mass.

GRINDING WHEEL DRESSER

Desmond Cutter

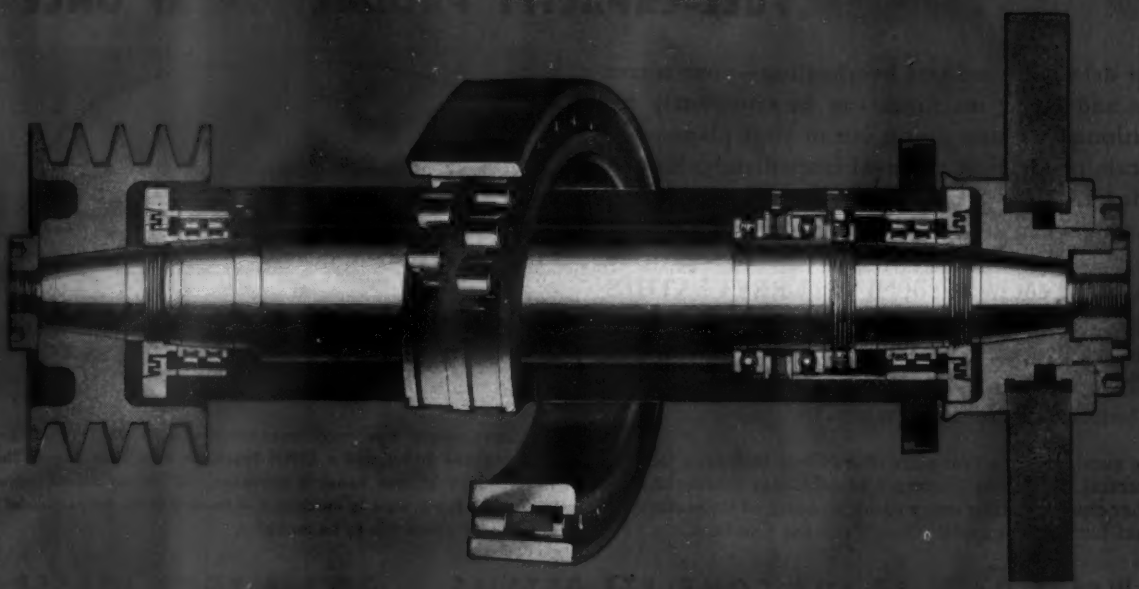
Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO
Canadian D-S Mfg. Co., Hamilton, Ont.

THE SPINDLE WITH MORE ABILITY

POPE



SPINDLES used for *Precision Grinding* are subject to two kinds of working loads: *Radial*, as from the wheel pressure on the work and from the belt pull, and *axial* in shoulder grinding or cup wheel grinding.

Factory experience has shown that the best performance results from the use of separate sets of bearings for the radial and thrust loads respectively. The original high quality of finish is also maintained much longer by this arrangement.

In POPE Spindles, up to 4000 R.P.M., the radial loads are carried on SKF double row roller bearings having enormous excess capacity. The great number of rollers in each bearing provides practically continuous support around the circumference of the shaft thus insuring smooth operation.

Contributing greatly to this result is the means by which each bearing is independently adjusted in assembly to provide the exact amount of *purely radial* preload required for best grinding finishes and longest life.

Thrust loads are taken on a separate pair of precision thrust bearings. These are of ample capacity and designed for accurate control of thrust and for long life.

POPE builds spindles on the principle that no spindle can be too good for precision work. Among the values built into POPE Precision Spindles are engineering by spindle specialists, workmanship by master craftsmen, plenty of the right kind of steel, plenty of selected precision bearings and POPE *Sealed Lubrication* requiring no attention for the life of the bearings.

POPE builds a wide variety of spindles for precision work.

Ask for a quotation on the spindle you need.

No. 21

POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

REG. U. S. PAT. OFF.

LYNN

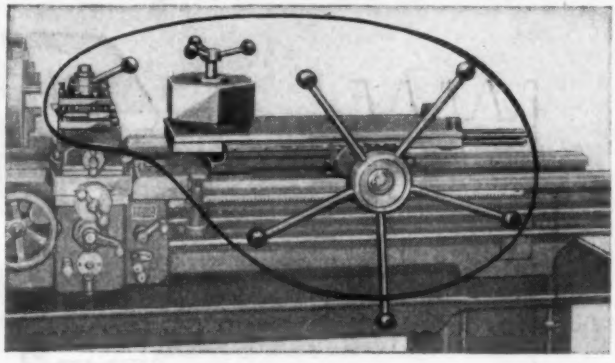
Reconditions Your TURRET LATHES and SCREW MACHINES *Overnight at Low Cost*

Puts Idle or Unproductive Lathes Back Into FULL-CAPACITY PRODUCTION AT ONCE

● No delays, no tedious overhauling—your turret lathes and screw machines can be completely reconditioned without going out of your plant—and full-scale production resumed immediately. Simply mount LYNN Bed Turret units on your machines, replacing worn or inaccurate turret parts. These finely machined and perfectly fitting units provide you with the equivalent of NEW TURRET LATHES in capacity, accuracy, speed and wide range of operations.

LYNN turret units can also be used to convert engine lathes to turret lathe work.

We manufacture a complete line of Self-Indexing Bed Turrets, Tool Post Turrets, Cut-off Cross Slides, and other equipment for every make and size of lathe. Also Steel Lathe Legs and Splash Pans for Coolant.



The lathe above has been reconditioned with a LYNN BT-3—Self-Indexing Bed Turret and a LYNN Precision Tool Post Turret. The Bed Turret has 9½" hex head, 6 positions, 10" turret travel, automatic index. The turret base is machined at factory to fit the particular make of lathe on which it is to be mounted.

WRITE OR WIRE FOR COMPLETE DETAILS . . . OR SEE YOUR JOBBER

LYNN MANUFACTURING COMPANY, 224 Elroy St., Minneapolis 8, Minnesota

Columbia TOOL STEEL

GOOD TOOL STEELS
(Water Hardening)
COLUMBIA SPECIAL—
Fine grain, deep hardening.
COLUMBIA EXTRA—
Controlled grain, medium or deep hardening.
High surface hardness with shock-dampening core.
It pays to use Good Tool Steel

COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

MAIN OFFICE AND WORKS

50 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

PALMGREN

ANGLE—DRILL PRESS—PRODUCTION VISES

No. 000 ANGLE VISE

Mounted on Swivel "M" Base

For Drilling, Milling, Grinding, Filing, Fitting, Etc. Permits setting up of angle work accurately and quickly without clamps, wedges or make-shift methods. Accurately graduated for all angles, once set it stays locked. Precision machined of semi-steel casting. Jaws are hardened steel—plain or grooved. Sizes 1½" to 8".

HEAVY DUTY PRODUCTION VISES

For fast, heavy work. Adjustable cam locking lever. Movable jaws, hardened and ground. Sizes 3" to 8" Jaws.

FLANGED MILLING MACHINE VISE

Clamps to table of milling machine, grinder, etc. For heavy work. Has hardened and ground jaws 6" wide, 2" deep.

DRILL PRESS VISES

For every purpose. Accurately machined, best semi-steel castings. Long bearing adjusting screw. Jaws hardened steel—plain or grooved. Sizes 1½" to 4".

No. 250 MILLING ATTACHMENT VISE

MAKES MILLING OPERATIONS POSSIBLE ON LATHE

A necessary fixture for small shops and emergency work in large shops. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical angle adjustments. Easily mounted on cross slide and held by one T-Slot bolt. PALMGREN VISE has 2½" Jaws opening full 2½". Depth Jaw 1-7/16", one plain and one grooved jaw for holding round pieces. Height 10¾", Price $24.75.

WRITE FOR CIRCULAR 348. Contains full description and prices of our complete line of vises.

CHICAGO TOOL and ENGINEERING CO.

8354 South Chicago Avenue Chicago 17, Ill.

Oakite cleaning materials and methods not only are at work helping contractors attain volume production of rocket shells shown here, but help the U. S. Victory Program on . . .

Large and Small Caliber Shells
Bombs • Detonator Caps
Airfield Landing Mats
Land Mines • Anti-Tank Mines
Mortar Shells and Tubes
Cartridge Clips • Powder Boxes
Machine Gun Barrels and Parts
Flare Bomb Cases
Burster Tubes • Shell Ogives
Booster Caps
Fin Assemblies
Fuse Bodies and Parts

OAKITE CLEANING

Materials and Methods Help Contractors Meet Production Demands

The Oakite organization helps the Nation's prime contractors expedite volume production of this sensational new weapon.

Time tested by war's exacting demands, Oakite materials and methods speed essential cleaning operations on rockets by effectively removing scale and rust, preparing the surface and otherwise conditioning rocket bodies prior to painting. Welding flux, grease, dirt and emery dust are removed from intricate, close-tolerance machined parts, and fabricated components.

All time-saving production "musts" and tough inspection standards are hourly being met all along the line by Oakite materials and methods.

Personal Advisory Service

Our Technical Service Representative near you has a wealth of wartime experience with cleaning practically all types of Army and Navy matériel. A partial listing of items is shown at the left. If you have a cleaning problem, ask to have the Oakite representative call. Should you write us direct, please give brief details of your problem.

OAKITE PRODUCTS, INC., 14A THAMES STREET, NEW YORK 6, N. Y.

Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS...METHODS...SERVICE

Buy Bonds for Victory

CLEANING FOR EVERY CLEANING REQUIREMENT

Send for this

NEW MANUAL of BROACHING

MOST COMPREHENSIVE Book On Broaching Ever Published

- **88 PAGES**
- **96 PHOTOS**
- **54 DRAWINGS**

The new Detroit Broach *Manual of Broaching* covers design and usage of all types of internal broaches, face plates and broach pullers; a general discussion of the principles of surface broaching with many examples and including a section devoted to fixtures, broach holders and inserts; a review of all types and makes of broaching machines outlining their various uses and advantages for particular types of work; and a large section devoted to the operation and maintenance of broaching equipment including broach sharpening.

Write for your copy now. Please use your company letterhead.

ARMED FORCES BROACHING TOOL INSTITUTE

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE • DETROIT 12, MICHIGAN
9308 SANTA MONICA BLVD. • BEVERLY HILLS, CALIF.

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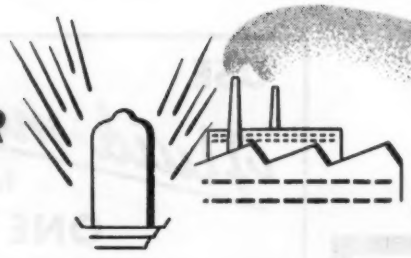


...PREPARE FOR

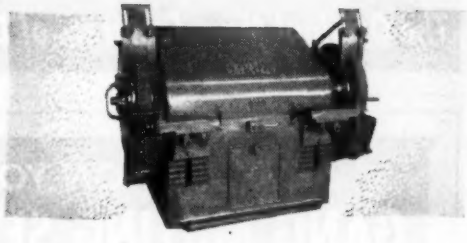
RUSH RECONVERSION

When the time for reconversion comes the pressure will be on the foundry and machine shop for fast and efficient action. Here's where SAFETY foundry equipment will help blast jams and bottlenecks—by keeping jobs moving with less time and labor, at lower cost.

SAFETY EQUIPMENT FOR GRINDING KEEPS JOBS MOVING FAST!

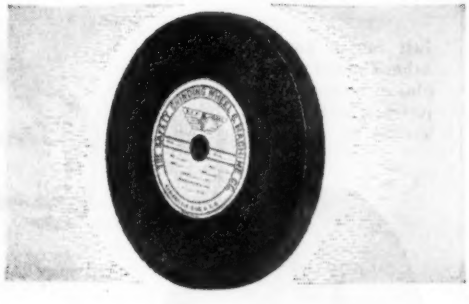
SAFETY "Rite-Speed" Grinders

Assure constant S.F.P.M.—the same at the end as at the start of the job. No stopping to step up or change speeds! No over speeding! Reduces time and labor!



SAFETY Grinding Wheels . . .

Fast cutting, velvet finish, long life, low operating cost. The pinnacle of grinding performance.



Other *SAFETY* Products . . .

Yes, and there are other SAFETY products—invaluable NOW as well as for reconversion days ahead. Write for details!

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GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

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Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field—the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

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T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

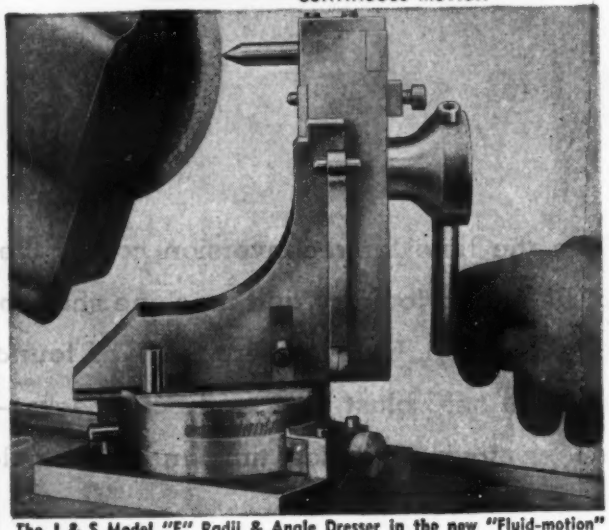
The Original Manufacturers of Drill Chucks

USE

Fluid-motion

for modern form-dressing

ONE SETTING
HANDLE
CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
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14" wheel capacity.
Versatile and adaptable.

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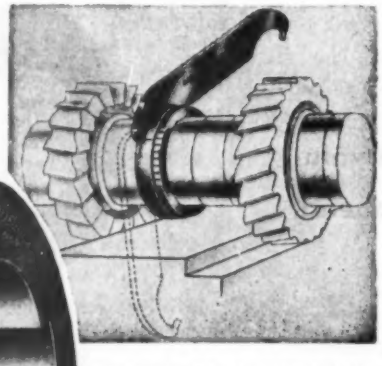
SAVE TIME ON YOUR

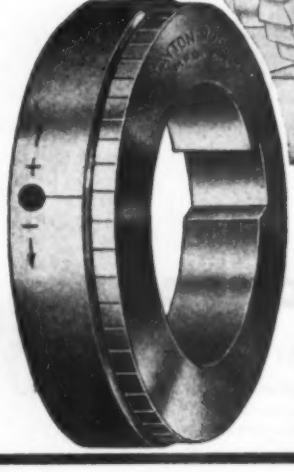
GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling set-ups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.





"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

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"ROCKWELL" HARDNESS TESTER

Now and always made only by

WILSON

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An Associate Company of American Chain & Cable

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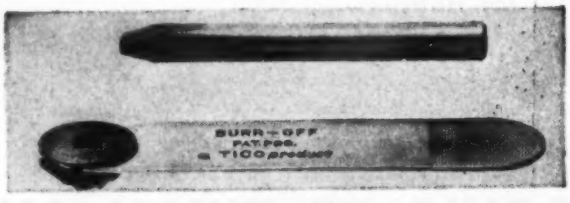

PAT. NO. 2351578

For fast clean removal of burrs and chamfering holes (inside & outside) of multi-walled parts—where regular solid countersinks will not reach.

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Williams Box "Superrenches", with their thin head walls, permit fast and safe operation where clearances are limited. Offset handles clear obstructions that would otherwise bark knuckles and generally slow up the work. Their 12-point openings grip hex nuts on six sides...preventing slippage and rounding of the nut's corners. Complete rotation of hex nuts is possible with these wrenches where handle swing is limited to as little as 30° . . . less than one-tenth of a full turn. Yes sir, these wrenches do guarantee more **output per man-hour!*

Williams Box "Superrenches" are made in a variety of popular patterns, including Structural and Striking face types. All are forged from tough alloy steel, heat-treated and fully guaranteed. Sold by Industrial Distributors everywhere.

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DROP-FORGINGS AND DROP-FORGED TOOLS

SHOWING HIGHEST QUALITY MEASURING AND CHECKING EQUIPMENT

SURFACE PLATES
Over 50 sizes, ranging from 7 x 7½ to 96 x 192.

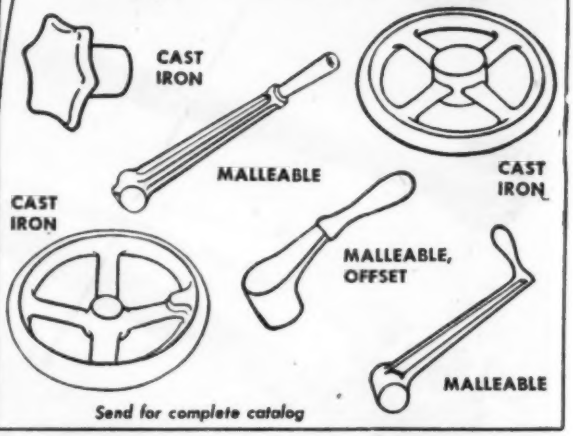
BOX PARALLELS
In 15 sizes, ranging from 3 x 4 x 12 and up — in ground finish.

SLOTTED ANGLES
In 19 sizes, ranging from 4 x 9 x 5 and up—in both scraped and ground finish.

UNIVERSAL ANGLES
In 10 sizes, ranging from 4 x 3¾ x 5 and up—in ground finish.
Special sizes made to order.

Also, measuring angles, angle plates, vee blocks, straight edges, boring mill parallels, steel parallels, cylinder squares.

KNOBS WHEELS LEVERS
Ready for immediate shipment



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We rescrape surface plates and repair angles, cubes, etc.

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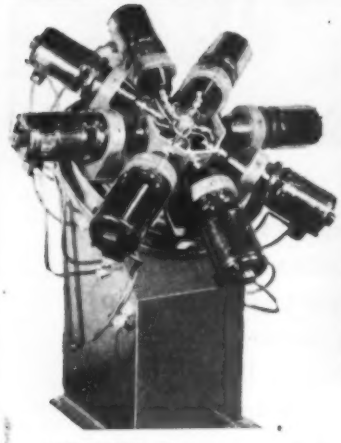

FOR GREATER *Speed* IN MULTIPLE DRILLING

WITH the set-up of 8 Govro-Nelson Automatic Drilling Units here shown, 8 holes of 9/32" diameter are drilled at a time through 3/16" steel in 2 seconds.

This high rate is made possible because of the fact that the Unit automatically safeguards the tool against breakage, permitting much faster drilling than with power feed mechanisms which must be set at low feed rates to protect partially dull drills.

Designed for drilling up to ⅜", depending upon the material. In nationwide use by war industries, speeding production and lowering production costs.

WRITE FOR *Literature*

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***Automatic* DRILLING UNIT**

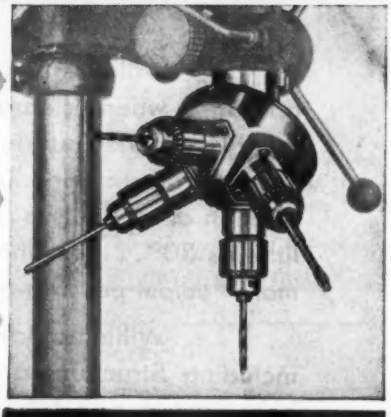
THE NEW **QUADRILL**
TURRET ATTACHMENT FOR DRILL PRESSES

RIGID ALIGNMENT STRICTLY ACCURATE

EASILY ATTACHES TO QUILL OF PRESS

QUICK INDEXING

FINGER-TIP CONTROL CHANGES DRILL POSITIONS



4 DRILL PRESSES IN 1

Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

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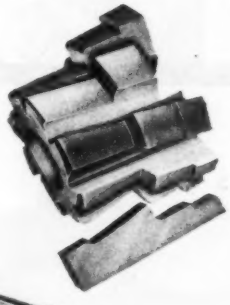
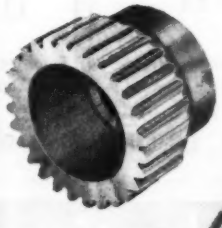
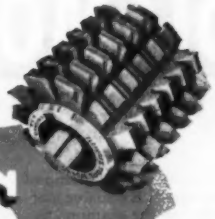
HEADQUARTERS FOR ENGINEERED CUTTING TOOLS







A *VITAL* ELEMENT IN ILLINITE *CUTTING* TOOLS

Progress in metal cutting tool efficiency demands constant research with new alloys. Illinois Tool metallurgists through continuous experimentation have developed many new qualities in high speed steel which are producing exceptional results on a wide variety of metal cutting applications. Enjoy the benefits of this research by asking for an Illinois Tool engineer. Your tooling will be analyzed in consultation with our metallurgists to assure properly engineered tools produced from the alloy proved most efficient for your purpose.

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MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

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HIGH SPEED CENTERS

between grinds on lathes and grinders equipped with RED-E High Speed Steel centers because they have high speed steel ends. All tapers and sizes. *Write for Bulletin.*

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ROCKFORD POWER-GRIP CHUCKS HOLD for A BIG BITE!

"The Deep Magnetic Penetration Does It"

The magnetic circuit in Rockford Power-Grip Chucks penetrates chuck and work, locking them together in a power grip that holds for heavy cuts on milling machine, shaper or planer.

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Four Spindle Head. All Spindles Adjustable for equally spaced holes.

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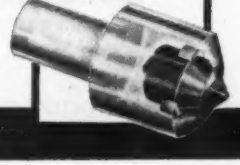
Equip Now with "RE-SET-ABLE"
Diamond Tools on Your Precision Grinding Production Line



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"Takes me a Lot Less Work to get More Work Done..."

(Color on the Tang is Trademarked)

Special *Red Tang* Long-Angle Lathe File removes stock quickly and smoothly, without clogging.

...with SIMONDS *RED-TANG FILES"*

Workers like *Red Tang* Files because they can remove more stock with less elbow-grease. And management likes them because they stay sharp and last longer, giving more "file-mileage" per dollar. *Red Tang* Files cut (instead of scrape) with teeth designed like the teeth of a Simonds metal-cutting saw . . . curl up long, even chips.

Made under ideal conditions in the world's first windowless plant, Simonds *Red Tang* Files come in only one quality . . . the highest standard to which *any* file can be made. So next time you need standard files, tell your dealer specifically to send you Simonds *Red Tang. Then measure the extra value you get.*

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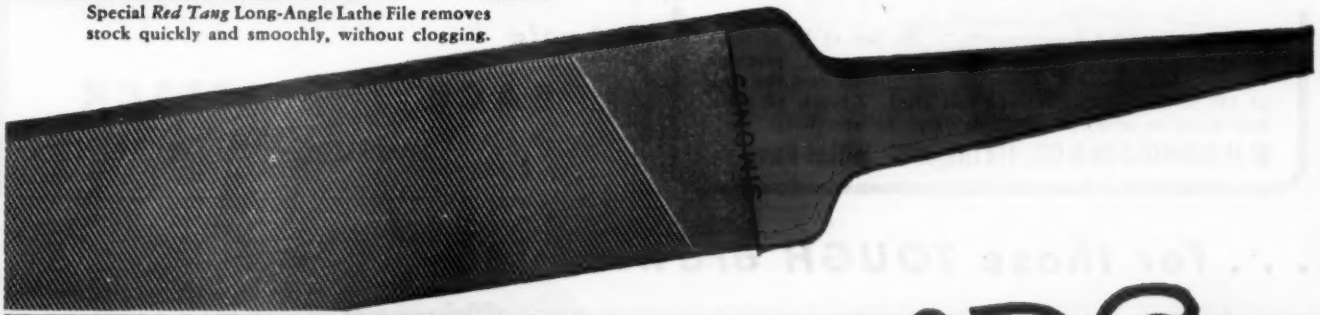


PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS

CUT THE WAR SHORT... BUY WAR BONDS... AND THEN BUY MORE WAR BONDS

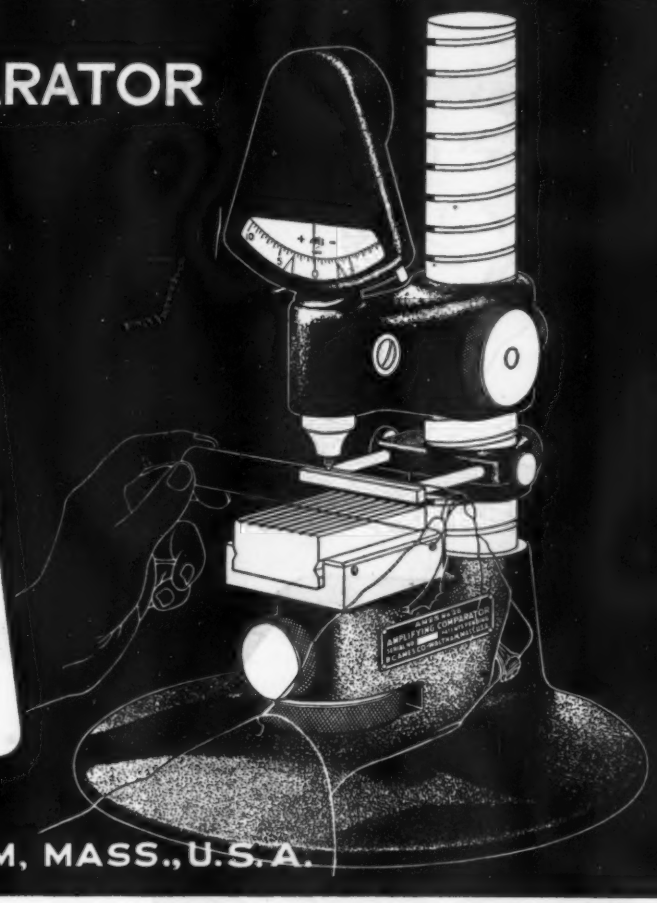
AMES No. 26 COMPARATOR

This precision built Comparator stands solidly on a large diameter base and is heavily constructed to eliminate all spring. It is intended for use in making comparisons of duplicate parts for size and will indicate the most minute variations on the dial, with ability to give repeat readings.

The cast iron base supports the steel upright column, which is grooved to provide an adjustable stop for the indicator bracket. Fine adjustment of indicator is made by moving dial with outside lever. The adjustable stop assembly helps to locate work on the hardened and ground anvil.

SPECIFICATIONS

Total height 15". Base diameter 11".
Total measuring capacity 6"
Fan Head total range .002"
Distance from contact to front of Post 3½"
Anvils 2⅛" x 3¼". Special anvils to order
Approximate weight 40 pounds



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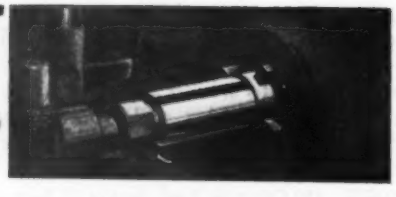
SAVE
Setting-Up Time with



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Right in the Lead
THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

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***By Buying* WAR BONDS**

. . . for those TOUGH drawing jobs—

The performance of SuperKool in accomplishing impossible draws has made friends for it in plants producing all types of metal products from kitchenware to bombs. SuperKool spreads smoothly, adheres well, and holds up under highest pressures. Stuart Oil Engineers are qualified by long experience to help you with your metal working problems. D. A. Stuart Oil Company, Limited, 2729 So. Troy Street, Chicago 23, Illinois.

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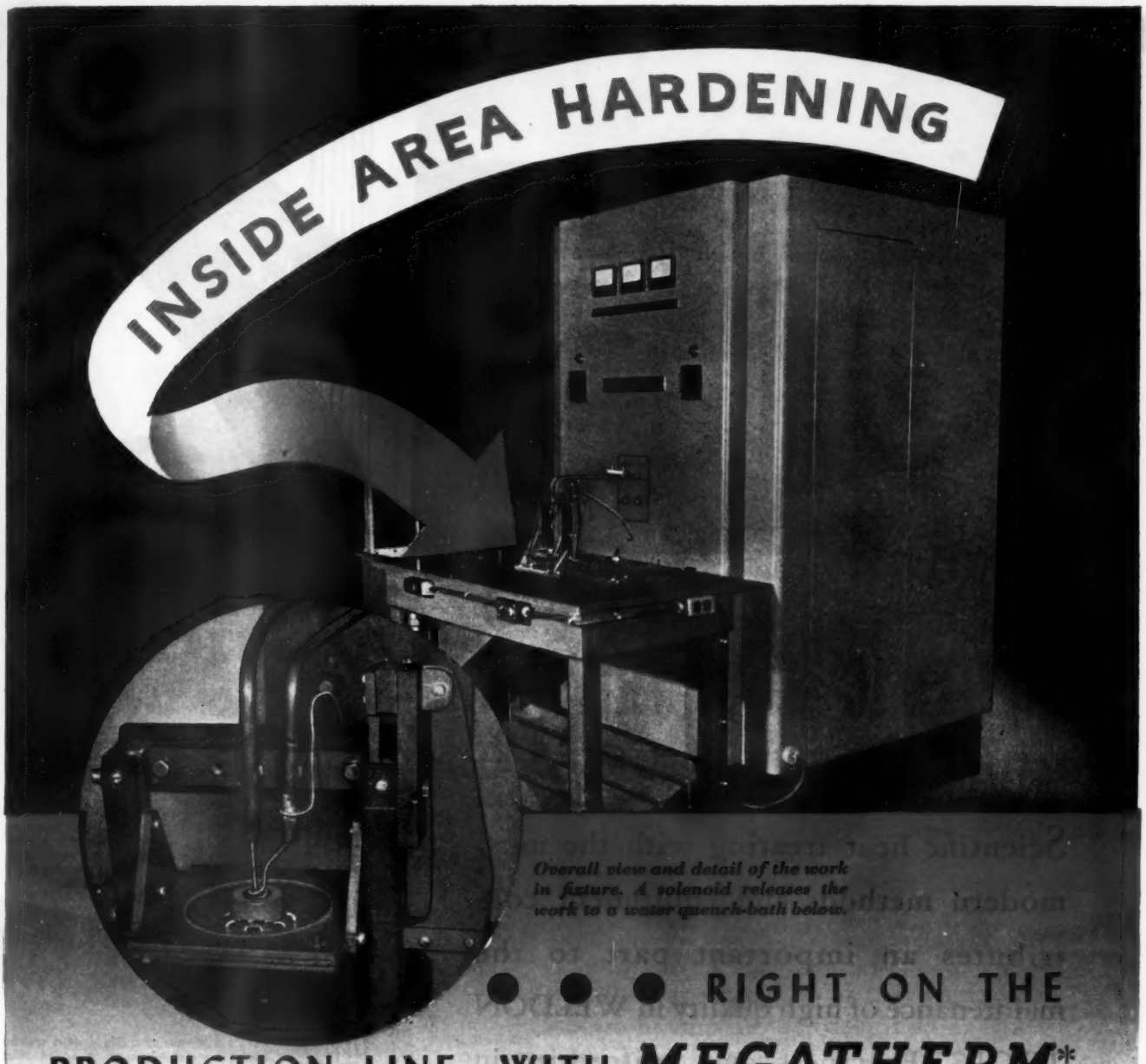
Stocks in All Principal Metal Working Centers

INSIDE AREA HARDENING



Overall view and detail of the work in fixture. A solenoid releases the work to a water quench-bath below.

● ● ● RIGHT ON THE PRODUCTION LINE—WITH *MEGATHERM**

In just six seconds Megatherm electronic heat hardens the inside surface of this sheave hub, controlling the hardened depth to vary from .125" at the rims, to .030" at the center.

Moreover, this hardening is accomplished without affecting the toughness of the surrounding metal.

To enable the Kimberly-Clark Corporation to successfully harden this hard to reach part, FTR engineers assisted in solving the problem through the use of megacycle energy.

Megatherm delivers the heat... when you want it... where you want it... *FAST.*

And Megatherm is versatile... will heat treat a wide range of irregular shapes and surfaces... shafts, bearings, cams, gear teeth, lever ends... and in hard-to-reach places.

Write to Dept. M for help on *your* heating problem.

Black area illustrates controlled variation in depth of hardening from .030" to .125", 40-45 Rockwell-C.

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WHALE BRAND

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Here's the original, time-tested HY-FLEX BLADE . . . scientifically heat treated to add the toughness that gives these blades their outstanding performance. They are gauged and checked throughout every step of their manufacture and given a stiff bending pounds test before you get them for use. HY-FLEX meets today's demand for a medium priced blade which is extremely flexible, yet has the toughness that assures long service life.

Here's a Whale of a Blade of a special analysis molybdenum, high speed steel that gives unusual cutting service. Can be used at the same cutting speeds as tungsten and deliver practically equal performance. If you want outstanding results on stubborn cutting jobs, ask your mill supply house for WHALE BRAND HY-FLEX and MO-HY BLADES and you'll get it.

Get to know the satisfaction in WHALE BRAND HACK SAW BLADES and FRAMES • BAND SAWS • COPING SAW FRAMES and BLADES • SCREW DRIVERS • HAND DRILLS. Ask for the catalog that describes these and other good FORSBERG TOOLS.

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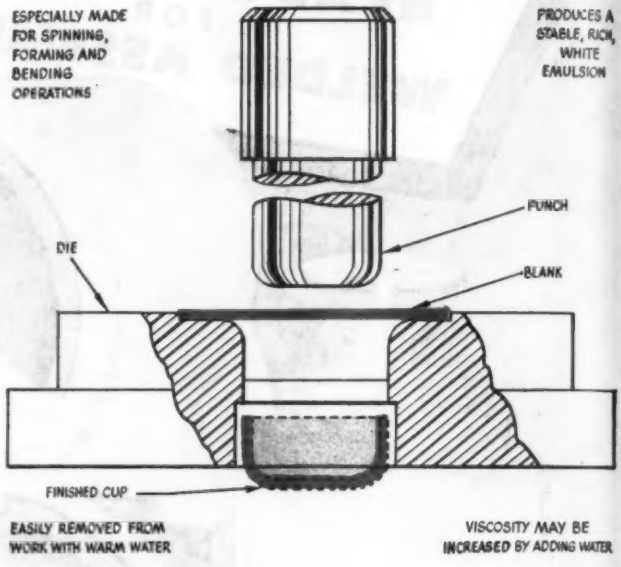
STEEL PRODUCTS FABRICATED BY RESISTANCE, ARC OR GAS WELDING

Heavy-bodied soluble oil cuts metal-working costs

The use of Calol Soluble Oil H. V. eliminates the expensive de-greasing process in metal-forming, aluminum-spinning and tube-bending operations, because it is easily removed from finished parts by plain water warmed to a temperature of 90° F. or above.

Especially made for these operations, Calol Soluble Oil H. V. has a viscosity considerably higher than ordinary soluble oils. Its viscosity can be still further increased for a particular operation by adding a slight amount of water. With addition of more water, Calol Soluble Oil H. V. forms a rich, white emulsion that is exceptionally stable.

This product is not for use in milling machines, lathes and other machining tools. When soluble oil is required on such machines, Calol Soluble Oil or Calol Soluble Oil E. P. is recommended. There is a Standard of California Product for every metal-working operation.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PRODUCES A STABLE, RICH, WHITE EMULSION
PUNCH
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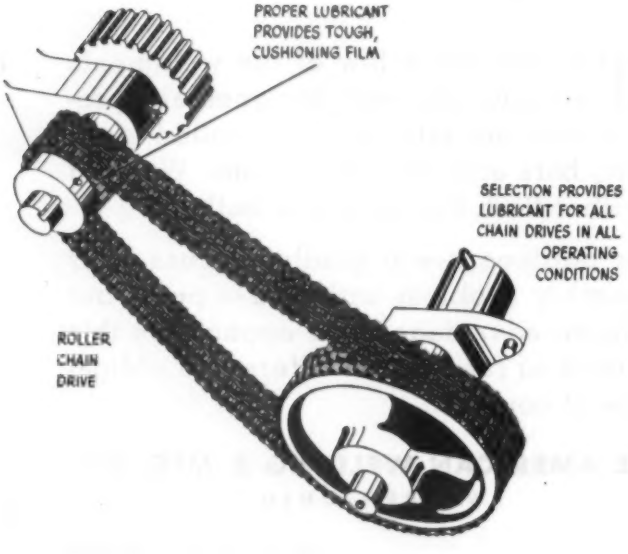
FINISHED CUP
EASILY REMOVED FROM WORK WITH WARM WATER
VISCOSITY MAY BE INCREASED BY ADDING WATER

Correct lubricant reduces chain drive wear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SELECTION PROVIDES LUBRICANT FOR ALL CHAIN DRIVES IN ALL OPERATING CONDITIONS
ROLLER CHAIN DRIVE

Selection of the proper Calol lubricant for any type chain drive will materially reduce wear even under the most adverse conditions.

On a worm or exposed roller and block chain, Calol Pinion Grease—0 is recommended for high operating temperature, Calol Roller Oil—X for medium and Calol Journal Oil—135 for low. For enclosed chains of this type, Calol Journal Oil—165, —135 and —35.

For chains exposed to pitch, resinous materials, etc., special Calol Drier Chain Oil is recommended.

Recommendations for silent chain drives are as follows: Worn, exposed chains: Calol Roller Oil—X, high temperature; Calol Journal Oil—135, medium temperature; Calol Journal Oil—35, low temperature. New, exposed chains or oil-bath-lubricated encased chains: Calol Journal Oil—135, —35 and —25. Splash-lubricated, encased chains: Calol Journal Oil—35, —25 and —14.

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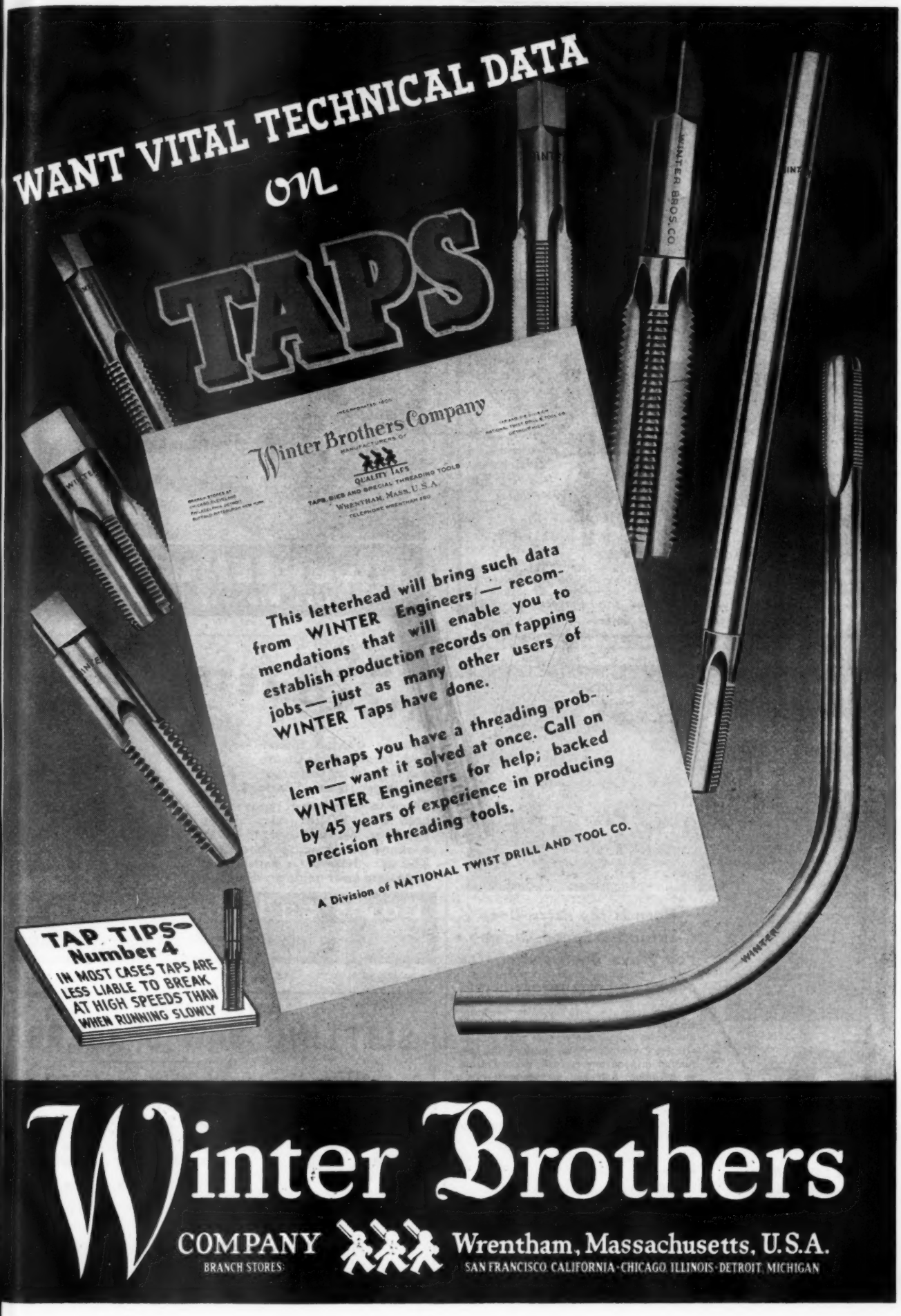
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on
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Winter Brothers Company
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QUALITY TAPS
TAPS, DIES AND SPECIAL THREADING TOOLS
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IN MOST CASES TAPS ARE LESS LIABLE TO BREAK AT HIGH SPEEDS THAN WHEN RUNNING SLOWLY
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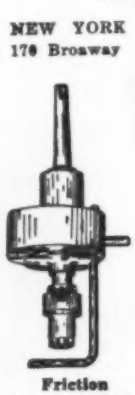

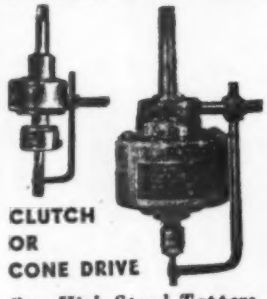

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OR
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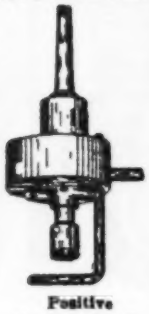

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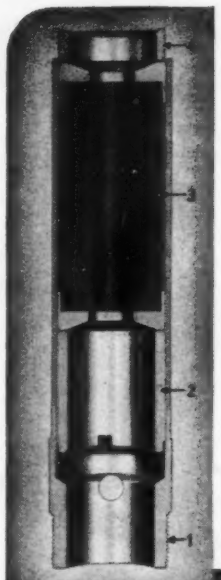
Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.



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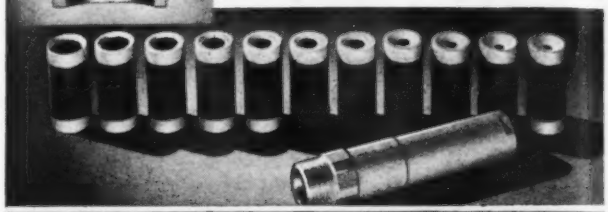
Screw machine operators need not look through hundreds of fingers and pads for a needed size. One GREEN Master Feed Finger, with a small number of oil-resistant synthetic inserts, will cover a wide range of stock sizes. For stock smaller than the nominal size of the insert, the tension adjusting screw (2) is simply taken up a few turns until it compresses the rubber insert (3) inside the finger sleeve (4) enough to give the desired tension on the stock. The feed tube adaptor (1) is then turned up to lock the adjustment. GREEN Master Feed Fingers *will handle all materials equally well without marring*, and inserts can be easily furnished to fit special-shaped bar stock exactly. *Write for circular giving full details.*



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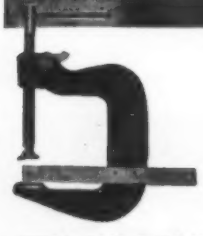
- INSTANT TRIGGER RELEASE
- SPATTER-PROOFED



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Made of Alloy-Steel of Forged Clamp Capacity.

SPATTER-PROOFED—All working parts are COPPER PLATED against welding spatter.

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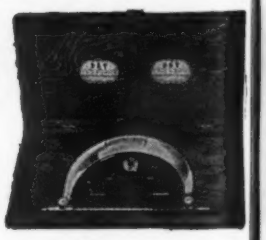

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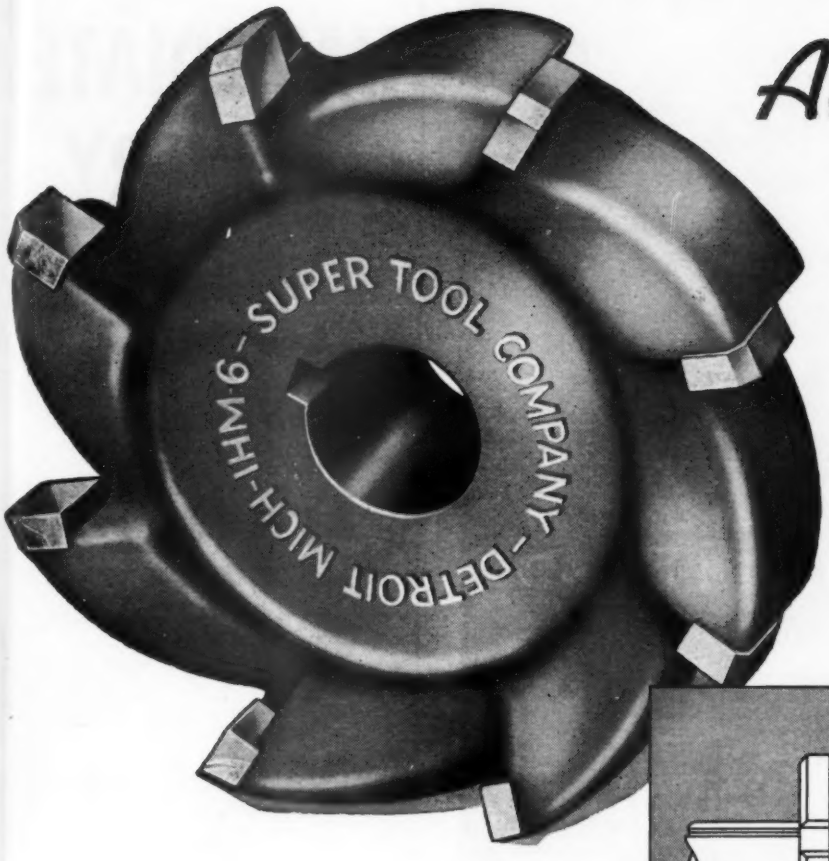

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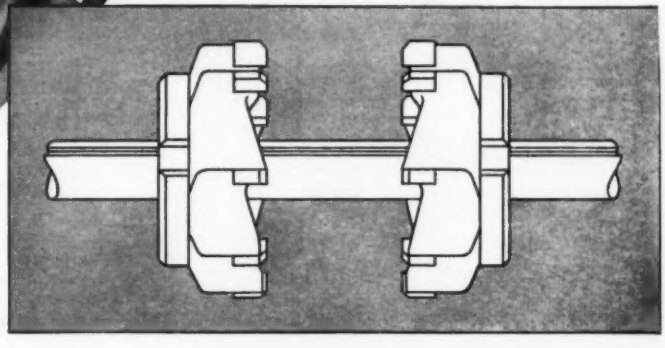

Designed to be used in pairs for straddle milling or singly to cut on one side only

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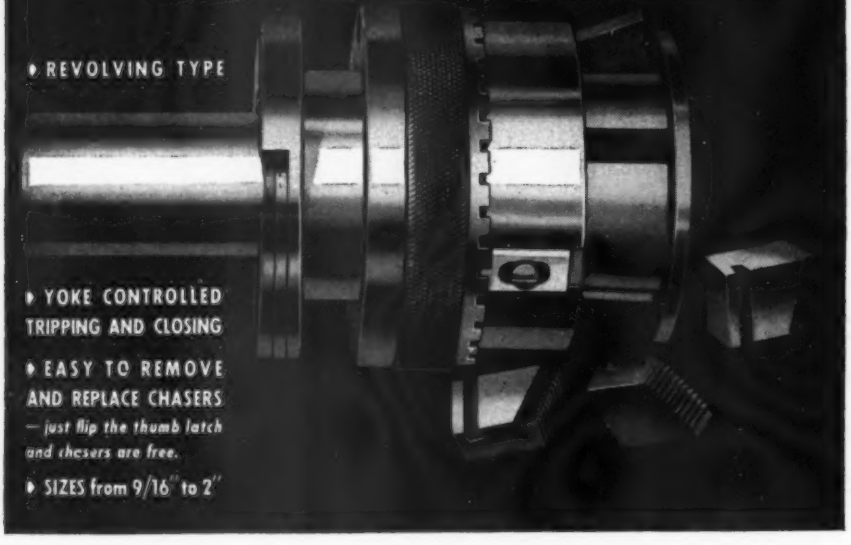
MODEL "C" *Automatic Self-Opening* DIE HEAD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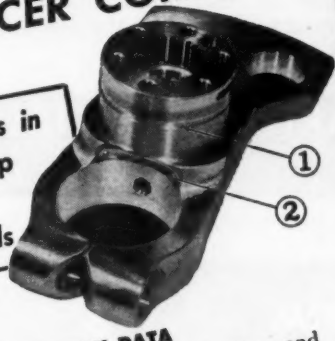
Two Operations in a Single Setup without Changing Tools



• A prominent airplane engine manufacturer cut production costs, saved tying up expensive machinery and conserved skilled workmen by profile milling this radius of an engine crankshaft section on the Gorton Duplicator. Semi-skilled help operated this machine, obtaining smooth finish on the profiling of the irregular channel contour (1) on the part shown at right, and the milling of the channel (2) below this contour.

The Duplicator was set up with a special master in order to eliminate changing tools or resetting the work. A special fixture was used to hold the work at an angle to allow cutter access in milling the channel.

The Gorton Duplicator is the ideal machine for handling jobs like this where uniformity in quality and high precision repetition of all dimensions is required.

PRODUCTION DATA

Operations—Profile Mill .369" Radius and Mill Channel.
Machine—GORTON 9-J Super-Speed Duplicator.
Part—Rear of Crankshaft—Steel.
Cutter—Special .738" dia. Ball Cutter—4 Flute.
Holding Method—Special Fixture.
Feed—Manual.
Spindle Speed—500 r.p.m.
Stock Removed—1/8".
Floor-to-Floor Time—15 minutes per piece.

GORTON ENGINEERING SERVICE—

You are invited to consult Gorton engineers, without obligation, on your next production profile milling jobs. Gorton "Tracer Control" may give you the simplest, practical answer to lower cost production. Please submit part, print or specifications to your nearest Gorton Dealer or to the Gorton Factory at Racine, Wisconsin.

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From 2 oz. to 2 ton
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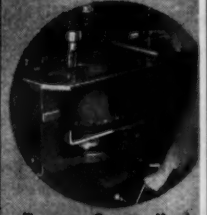

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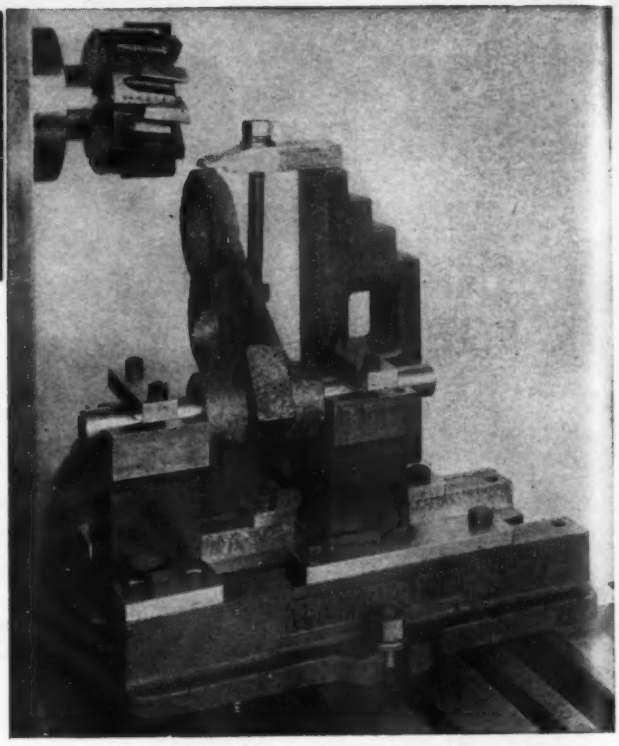
The Hartford V-Block Fixture consists of an accurately ground and scraped base provided with facilities for holding to machine table. Hardened and ground V-Blocks can be positioned as required in the base and are held by clamps.

As used here, the Hartford V-Block Fixture is holding an irregular piece of work during an end milling operation. Note how the work is securely clamped in the V-Blocks and the means provided for holding the base of the fixture from the T-slots of the table.

This application of the Hartford V-Block Fixture is but one of many where this device can be used to advantage in milling, drilling and boring operations on irregular work. Inspection and set up, too, are facilitated because the ground and scraped base provides the precision necessary for accurate use on surface plates.



The versatility of this device is described in illustrated literature available promptly on request. Write for further details TODAY.

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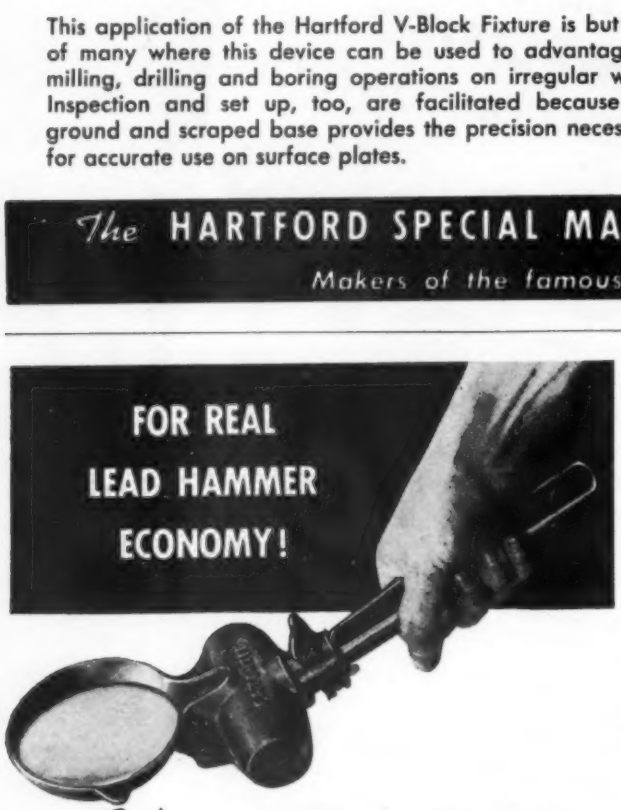

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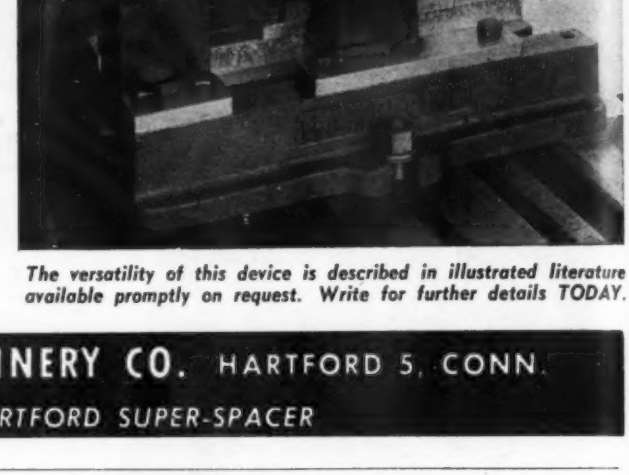

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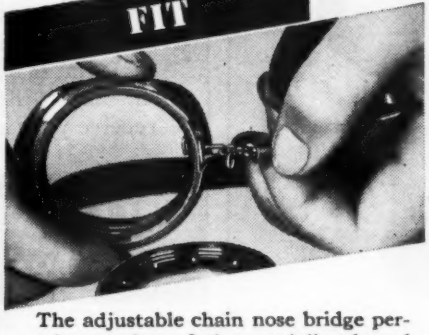

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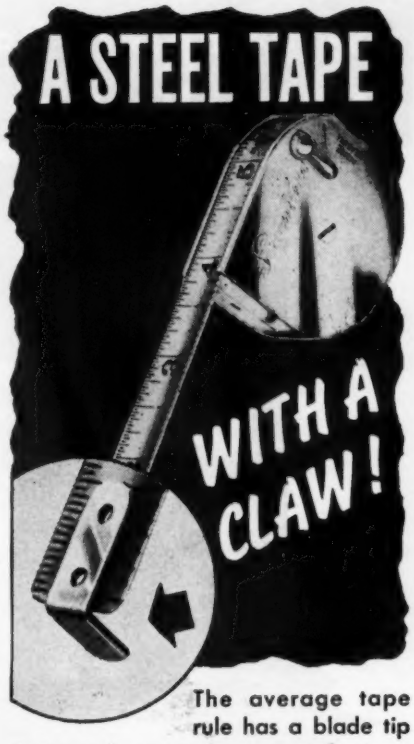

The average tape rule has a blade tip that merely serves to prevent the tape from sliding into the case. Theoretically it is supposed to catch and hold the edge of the object measured—but it doesn't. The tip of the Streamline, however, is 7/16" long—a real claw that actually serves the purpose for which it was designed.

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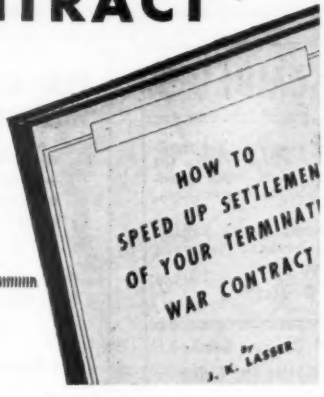
By
J. K. LASSER

C.P.A. in New Jersey and California; Chairman, Institute of Federal Taxation, New York University.



175 pages, 8½ x 11
$3.50

Paves the way for quicker, smoother settlement of your war contracts—Helps you get maximum allowable amounts

THIS brand new J. K. Lasser guidebook shows, step by step, what to do, how to do it, when to do it—how to handle your plant operations, inventories, and settlements before and after you receive a termination notice. A boon to every concern, small or large, doing business under a War or Navy Department contract or a subcontract. Written in the same crisp, point-by-point manner as the author's famous tax guides, it actually blueprints a short cut through the seeming maze of procedures, requirements, forms, etc., you face in termination of your war contract. Start using it at once, to pave the way for smoothest, quickest settlement, and to aid in getting the maximum allowable amount.

• **COMPLETE:** Covers everything; inventories, costs, how to handle subcontractors, how to make up claims, how to get financing during settlement, how to negotiate a settlement, how to appeal, etc. **Includes a full guide for subcontractors.**

• **CLEAR:** Covers subject in many detailed sections, fully explaining each step. Gives all necessary forms. Many check lists, section headings, key questions, to help you find answers quickly, make sure nothing is overlooked.

• **AUTHORITATIVE:** The author had all the aid he sought from government officials supervising contract termination; his book gives you informed, dependable instructions.

• **TIMELY:** Tells what you can do NOW, to prepare for quickest, smoothest settlement, when termination is in full swing and government agencies are crowded with work.

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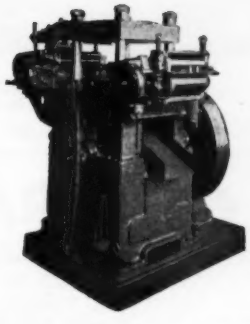

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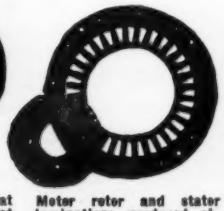

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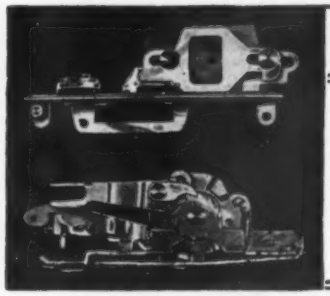

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Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

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DEPARTMENTAL STAFF
330 W. 42nd St., N. Y. 18, N. Y.

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Before and After— Brown & Sharpe Screw Machine Division » » » »

Illustrated are two Brown & Sharpe Automatic Screw machines. One has been completely rebuilt by J. L. Lucas & Son, Inc.; the other has just been taken out of production.

Between these two machines lies the difference of Lucas' forty years experience in the machine tool industry, several hundred applied man hours by Lucas craftsmen, and Lucas advanced engineering methods. LUCAS-REBUILT Machine Tools are *guaranteed* to produce accurate work over a long period of time. In addition to a department specializing in Brown & Sharpe automatics, skilled Lucas craftsmen working with the most modern equipment in 52,000 square feet of floor space, are prepared to rebuild every type of metal-working machine tool in your plant.

THIS is the third of a series telling the Story behind the Lucas nameplate on Machine Tools.

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SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (essential products) has opening for mechanical engineer with some machine design, factory lay-out, and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of applications. P-205, American Machinist, 330 W. 42nd St., New York 18, N. Y.

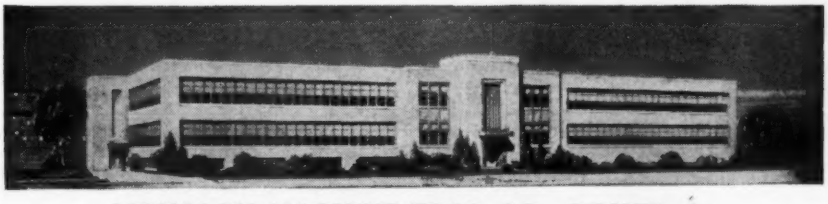
WANTED SUPERINTENDENT or Works Manager small plant building machine tools. Opportunity for young man to demonstrate ability and acquire good income for post-war. Location within 150 miles of Cincinnati. State experience, starting salary and particulars of education, training, etc. Confidential. P-276, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANIC OR Tool Engineer—thoroughly familiar with tool setups and machining stainless, alloy, carbon steels. Required for customer contact work by steel distributor covering Eastern states. Write stating age, education, experience, draft status, availability, and salary expected. Replies strictly confidential. P-286, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MECHANICAL ENGINEER—Established company, 75 years old, located in Newark, New Jersey, small carbon steel products essential to everyday life, has desirable opening. Party will operate direct with ownership management. Give complete details of personal qualification and work history in your letter of application to be considered. P-287, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 304)

WANTED
PRECISION MACHINE DESIGNERS, DRAFTSMEN



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Builders of Precision Turning Machines Since 1909

SENIOR TOOL ENGINEERS
CHIEF TOOL DESIGNER
Openings in Detroit & East. Postwar future. Large engineering firm. Give complete details in reply.
P-255, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

ENGINEERING EDITOR
ME GRADUATE
PREFER man about 40 with SOME PRACTICAL ENGINEERING EXPERIENCE. Position consists of preparing Booklets dealing with Lubrication of various types of machinery. PERMANENT POSITION. Major Oil Co. Located in N. Y. C.
STARTING SALARY $5000
Give full details including Age, Experience, Education.
BOX S-901, FINNERAN
1475 Broadway New York 18

Additional Employment Advertising on page 304 and 306

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UNDISPLAYED RATE:

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10 cents a word minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED RATE:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVRRTISEMENTS received by 10 A.M. May 24th will apear in the issue of June 7th subject to limitation of space available

POSITIONS VACANT

(Continued from page 303)

WANTED: Wisconsin corporation requires experienced man thoroughly familiar with machine shop practice, as assistant to general superintendent, technicall ytrained engineer preferred. Excellent post-war opportunity. P-288, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED BY manufacturer of hydraulic presses and related equipment. An experienced Designing Draftsman for designing special hydraulic and mechanical machinery. Also an experienced Checker for checking engineering department drawings. In reply, please send photograph, qualifications, and state salary desired. The Denison Engineering Company, 1160 Dublin Rd., Columbus 16, Ohio.

WANTED: DETAIL Mechanical draftsman by machine tool builder in western Pennsylvania. Statement of availability required. Write giving experience, etc. to P-289, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF DRAFTSMAN—Capable of directing a drafting room of a well estabished firm. Must thoroughly understand requirements for production drawings involving small interchangeable parts. Must be able to plan ahead and assume responsibility. Permanent position—excellent working conditions. In first letter give details of personal qualifications, work history. P-291, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years, recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

TOOLROOM FOREMAN, long and varied experience metal stamping work, prefer a southern or western location. PW-280, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

FACTORY EXECUTIVE, 46, desires new connection with firm having good post-war program. 28 years industiral experience, including supervision tool design, tool making, experimental development and sheet metal fabrication. Chief inspector, aircraft engines and propellers, tool and gage engineer, process engineer and master mechanic, sheet metal and screw machine products, among former positions. Intimate knowledge of time and motion study, wage incentive, departmental organization, and inspection and production procedures. References and detailed experience furnished to interested parties. PW-290, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL ENGINEER wants connection progressive concern. Twenty years experience metal fabrication industry. Competent in tool design, production, plant layout. Long or short time arrangements. Available soon. PW-277, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

POSITION WANTED

EXECUTIVE ASSISTANT, WORKS MANAGER OR ASSISTANT WORKS MANAGER. 34 years old with 20 years of successful practical experience from Apprentice to Assistant Works Manager. Engineering education obtained in evening schools. Well versed in old and new manufacturing methods, progressive ideas, aggressive, sound judgment and ability to assume responsibility. Position need not be in mechanical field although preferred.

PW-285, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

POSITIONS WANTED

MECHANICAL ENGINEERING graduate, age 34, 11 years metal working and wood working experience, embracing gage design, control and buying, engineering specifications and correspondence, production methods analysis and plant layout, salary $600 per month. P. O. Box 243, Springwater, New York.

REPRESENTATIVES WANTED

WANTED: TO Represent manufacture of mechanical and electrical products suitable or suburban and rural trade. Efficient sales, installation and maintenance services available. Bank reference. RW-292, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EASTERN MANUFACTURER'S agent looking for service engineer to work the Philadelphia territory. Nationally known and advertised lines. RW-293, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVES WANTED—For chandler duplex boring and facing tool heads. .0001 adj. bores, faces, grooves, and turns small and large diameters. Territory available in many sections of the country. 3900 Reading Rd., Cincinnati, Ohio.

REPRESENTATIVES AVAILABLE

TOOL LINES wanted: Mechanical engineer, 9 years' experience as process engineer, 7 years manufacturing supervision; desires several small tool lines. Midwest territory preferred. Exceptionally good contacts in automotive industry. RA-264, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

OLD ESTABLISHED firm of manufacturers representatives is desirous of adding one or two additional lines for the Chicago territory. We have an excellent sales force and 25 years of contact with metal working plants. Any lines that would be suitable for metal working plants would be desirous. RA-294, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

BUSINESS OPPORTUNITY

FOR SALE on Royalty basis—Measuring tool that will measure accurately shafts up to 5" for size and roundness while turning. Also checks any depth, as grooves, threads, gear teeth, tapers, etc. Simple to manufacture and use. 811 10th Ave., SE, Cedar Rapids, Iowa.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

PRODUCT DESIGNER

Experienced in design & development of medium and small intricate mechanisms suitable for high production.

TOOL DESIGNERS

Experienced in design of high production dies, fixtures & special machines.

Excellent opportunity for responsible men interested in steady positions.

INTERNATIONAL REGISTER CO.

Personnel Dept.

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WANTED
MACHINE DESIGNER

Graduate engineer 30-40 for design and development of Textile machinery. Should have previous development experience on existing and new machines. Should be acquainted with modern shop practice and methods. Ability to supervise group of designers and draftsmen necessary. Location: Massachusetts.

State age, experience, details of education, draft status, present salary and salary expected. Post-war opportunity. USES certificate of availability and Draft Board clearance necessary. Send photograph.

P-253, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED ENGINEERS

Splendid opportunities are available with old established New England Organization for Designers of Tools, Special Machinery and Products Development. Reply giving age, experience, and salary expected.

P-283, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

WANTED
SALES ENGINEER — MACHINE TOOLS

to handle sales and related correspondence. Steady employment. New York City.

Write full details, age, experience and salary expected.

SW-282, AMERICAN MACHINIST
330 West 42nd Street New York 18, N. Y.

Additional Selling and Business Opportunity Advertising on Page 306

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FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

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● ● ● SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

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Lennox Splitting Shear, 8" throat, ¾" cap.
Lennox Bevel Shear, ¾" cap.
Niagara #98 Production Power Brake & Folder. 72"x14 ga. cap. Equal to new.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss 3 column B.G. 3" stroke.
Toledo#34 Back Flywheel, arranged M.D. (2).
Toledo #1 O.B.I.
Bliss-"Stiles", No. 1, No. 2 Plain flywheel.
Waterbury-Farrel 105-ton O.B.I., M.D., hi-spd, power Press, double roll feed. 1" stroke, Bed 37" R to L, 20" F to B.
Bliss #16 Horn Press, with screw adjustable table.
Toledo #2½ O.B.I. Plain Flywheel.
Etna #12 Dble Act. Plain.
#65 Bliss Dble. Act. Cam.
#GC3 Ferracute Geared Dble Act. Cam.

Waterbury-Farrel Cold Header, double stroke, open die, ½" cap.
Manville Cold Header, single stroke, solid die, 3/16" cap.

BORING MILLS

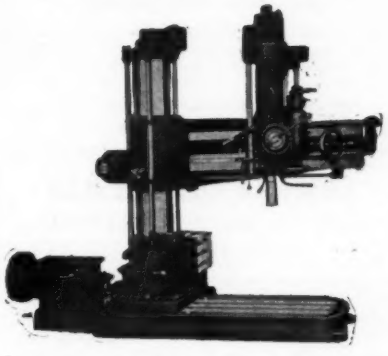
100" Niles-Bement-Pond Bor. & Turn. Mill.
48" Gisholt, vert. Boring & Turning Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
#31 Lucas Horizontal Boring Mill, 3" bar.

GRINDERS

16" Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
14"x36" Cincinnati Cyl., motor driven.
6"x32" Norton Cyl., overhead c/s drive.
12"x12"x36"—#2 Diamond Surface Grinder.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13", 4 spindle (2). 2 spindle (1).

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3' Dreses, 10" rd. col. QCG., M.D.
2½' Arm 9" Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford.
3' 9" col. American, S.P.D.

MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

MILLING MACHINES

No. OY Brown & Sharpe plain (2).
#3, #4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#2-#1½ Brown & Sharpe Plain Millers.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.

LATHES

Putnam, 26 x 12 Heavy Q.C.G., arr. for M.D.
American, 16 x 6 Q.C.G., Geared Head.
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
Seneca Falls Tool Room, 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper.
16"x6' Hendey Toolroom Lathe with relieving attachment, taper attachment, draw bar and collets. Geared Head.
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Lodge & Shipley 16" x 8' 12-Speed Selective Geared Head.
Hendey 14"x6' Toolroom Lathe with taper, collets, M.D.

1—1¼" Cone 4-spindle Automatic Screw Machine, M.D., complete.

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
14" Rockford crank shaper.
No. 2 Baker Keyseater.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.
Standard Automatic Drop Hammer, 300#.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

BUY FROM STOCK
Telephone
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MACHINERY COMPANY
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18 WARD ST.
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We offer well organized sales force to manufacturers desiring representation for present and post-war business. Good connections covering retail and jobbing trade. We seek items of merit. Can book post-war business now. Commission basis.

Inquire for further details

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295 MADISON AVE. NEW YORK 17, N. Y.

FOR SALE

(Additional For Sale ads on pages 305-313)

LARGE LATHES

84" Niles-Bement-Pond, 28' long, 17' centers, 72" geared face plate DC drive

32"x35' Wickes Grd. Hd., M.D.

36"x30' Putnam Grd. Hd., M.D.

42"x16' Putnam, M.D.

36"x22' Putnam Geared D.C. M.D.

30"x26' Lodge & Shipley 12 speed Geared Head, M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N. Y.

Attention!

MANUFACTURERS
WHO WANT IMMEDIATE NATIONAL
DISTRIBUTION
THROUGH
VOLUME SALES
MILL SUPPLY and RADIO JOBBERS

If you want to sell your tools, machines, radio-electronic parts or other items *quickly* thru a well established industrial sales organization, get in touch with us at once.

RA 273, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

INCOMES INCREASED

Machine and Tool Distributors afforded exceptional opportunity for expansion through nationally advertised products in great demand. Attractive arrangements provided. Let us explain fully.

RW-268, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

AMERICAN BUSINESS MAN
with own production facilities in FRANCE

looks for new technical products for either manufacture or distribution in the European post war market. Will resume residence in France, is thoroughly familiar with language and economic conditions and has close personal contact with scores of leading French industrialists and business men.

MANUFACTURERS interested in EXPORT please reply to

BO-284, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

BORING MILLS

60" Niles, 2-swivel heads, M.D.
42" Gisholt, 1-swivel and 1-turret head, Motor 3/60.
36" Colburn, single turret head, for M.D. (modern)

PRESS

No. 29 Bliss Knuckle Joint, Tie Rods, rated 1500-ton 4" stroke, 40" between housings. Catalog wt. 110,000 lbs. Good.

TURRET LATHE

26"x7½" Libby-International Geared Head for M.D., equipt with 22" Univ. Chuck and Taper Attachment. Serial No. C-7-7312. Good Condition.

GALBREATH MACHINERY CO.
Empire Building Pittsburgh 22, Pa.

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WANTED TO BUY
INDUSTRIAL PLANTS

ALSO
IDLE STEEL & PIPE

FOR DETAILS CONTACT THE
ATLANTA STEEL & SUPPLY CO.
"SALVAGE SPECIALISTS"
349 Decatur St., S.E. Atlanta 3, Ga.
Phones: Walnut 9412—Main 4947

WANTED

Rolling mill for laboratory use. Prefer 5" or 8" diameter mill equipped with roller bearings, and water cooled, grooved rolls, suitable for reducing 1" ingots to ⅛" rod. Floor space—not over 90" long x 70" wide. Weight—not over 6000 lbs. Motor requirements—3/60/440.

Must be available immediately
State Price and Full Description
CURTISS-WRIGHT CORP.
Airplane Division, Buffalo 5, N. Y.

Lodge & Shipley TOOL ROOM LATHES

16"x6'—geared head, 12 speeds, oil pan, S.P.D. stock um5149.

18"x8' geared head, 12 speeds, taper att., oil pan, 12" chuck, A.C. motor drive Stock um5162.

Wire or Phone

HASCO MACHINERY COMPANY
671 Frelinghuysen Ave., Newark 5, N. J.

WANTED
STEEL BUILDING
FOR
LIGHT MANUFACTURING

42 TO 45 FT. WIDE
14 TO 16 FT. FLOOR TO TRUSS
500 TO 570 FT. LONG

GLOBE AMERICAN CORP.
KOKOMO INDIANA

WANTED

New or used Rotary Double Pointed Tack Machine, as manufactured by A. H. Nilson Machine Company or equal.

M. D. GIARDINO
101 PARK AVENUE, NEW YORK 17, N. Y.
LExington 2-9288

UNIVERSAL TOOLS!
NATIONALLY ADVERTISED BRANDS AND PRICES
If it's A Tool—We have it, Can Get it, or it isn't made! PRICE LIST & ORDER BLANK FREE!!
UNIVERSAL TOOL COMPANY
O. B. Dematteis, President
1527 Grand A.M. Kansas City, Missouri.
Immediate Shipment: Overnight by Air:
To Anywhere—U.S.A.

WANTED BY
SMALL BOLT & NUT PLANT

COLD HEADERS—DOUBLE STROKE—BOLT TRIMMERS — ROLL THREADERS — SCREW SLOTTERS—#2 Surface Grinder—Power Feed

Must be late machines in excellent condition. Give full particulars, including price.

W-267, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

ELECTRIC WELDING RODS, coated

New, packed in original boxes. Sizes 5/32 inch, 8,000 lb; 3/16 inch, 17,000 lb; ¼ inch, 20,000 lb; 5/16 inch, 14,000 lb. Manufactured by Fleetweld, A. O. Smith, Areway, Sureweld and General Electric Company, at .03½¢ lb., in quantity lots.

AMERICAN SALES COMPANY
1562 HARRISON AVENUE CINCINNATI, O.

Eastern Rebuilt Machine Tools for Immediate Shipment

ARBOR PRESSES

15 ton Lucas High Pattern, s.p.d.
30 ton Lucas, m.d.
Barnes Screw Press, hand operated
King Screw Press, s.p.d.

AUTOMATICS

4 spindle 7/8" Cleveland Model M, m.d.
2¼" Gridley, m.d.
2¼" Cleveland Model A, m.d.
4 spindle 2¼" Cleveland Model K, m.d.
2½" Cleveland Model A m.d.
3¼" Gridley, m.d.
4¼" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
14" Fay Automatic, Flanders Type, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
No. 6D Potter & Johnston, m.d., arr. for brake drum work
No. 22, 23, New Britains, with tapping spindle
No. 33 New Britain, m.d., tapping spindle

VERTICAL BORING MILLS

24" Bullard New Era, m.d., side head
42" Bullard New Era, m.d., side head
42" Colburn, m.d., 2 heads
48" Cincinnati Rapid Production, 1 turret, 1 swivel head, m.d.
52" King, m.d., 2 swivel heads
10' extended to 16' Betts, m.d., 2 swivel heads
12' Niles, 2 swivel heads, m.d.

HORIZONTAL BORING MILLS

2½" bar No. 21 Lucas, m.d.
4" bar Lucas, m.d.
2¾" bar Sargent Floor Type, m.d.
3½" Betts, m.d., table type
3½" Rochester Floor Type, m.d.
4" Detrick & Harvey Floor Type, m.d.
4" Niles, m.d., table type
4½" Niles, m.d., table type
5" Niles-Bement-Pond Floor Type, m.d.
5½" Niles, m.d., table type

HORIZONTAL DRILLS

Love Bros., No. 4 Taper, m.d.
5 spindle Detroit, belt
6 spindle National Acme, belt
8 spindle Hammond, m.d., hydraulic
Pratt & Whitney Rifling Machine, belt
Pratt & Whitney 2 spindle Deep Hole, m.d.

RADIAL DRILLS

3½' American Triple Purpose, m.d.
3' American Sensitive, belt
3' Fosdick Sensitive, s.p.d.
3½' Cincinnati-Bickford Plain, m.d.
4' American Triple Geared, m.d.
4' American Triple Purpose, m.d.
4' Cincinnati-Bickford Plain, m.d.
4' Cincinnati-Bickford Plain, m.d. on arm
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, m.d.
5' Carlton Plain, 13" column, m.d.
5' Cincinnati-Bickford Plain, gear box
5' Dreses Plain, gear box
5' Niles-Bement-Pond Full Universal, gear box
5' Prentice Plain, m.d.
6' Cincinnati-Bickford Full Universal, gear box
6' Niles-Bement-Pond Semi-Universal, m.d.
6' Reed-Prentice, gear box
6' Western Plain, m.d.
7' Cincinnati-Bickford Plain, m.d.
8' American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

22" Barnes All Geared Self-Oiling
30" Rich H.D., m.d.
42" Barnes, m.d.

HAMMERS

400 lb. No. 400 Bliss Board Drop, belt
800 lb. Bement Single Frame Steam
1100 lb. Bement Single Frame Steam

PLAIN MILLING MACHINES

No. 2B Brown & Sharpe, m.d. in base
No. 3B Brown & Sharpe, m.d.
No. 3B Milwaukee Plain, double overarm, m.d.
No. 4 Cincinnati Plain, m.d.

VERTICAL MILLING MACHINES

No. 0-8 Cincinnati, m.d., latest type
No. 2 Brown & Sharpe, m.d.
No. 3 Cincinnati, m.d.
No. 3B Milwaukee m.d. in base
No. 3B Milwaukee, s.p.d.
No. 3V Toledo, s.p.d.
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.

MANUFACTURING MILLING MACHINES

No. 1-8 Kent-Owens Hydraulic, m.d., latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, with tracer control, latest type
No. 4-36 Cincinnati Plain Hydromatic, m.d., latest type
Hall Planetary Thread, m.d., for external threading
Hall Planetary Thread, m.d., for internal threading
18" Cincinnati Plain Automatic, m.d.
28" Cincinnati Plain Automatic, s.p.d.
4½x12" Pratt & Whitney Thread, belt
6x14" Pratt & Whitney Thread, belt
6x20" Pratt & Whitney Type B Geared Head Thread, m.d. in base
6x48" Pratt & Whitney Thread, m.d.
6x80" Pratt & Whitney Thread, m.d.
Becker Lincoln Type, belt
No. 2, 12 Pratt & Whitney Lincoln Type, belt
24"x6' Ingersoll Slab, m.d.
30"x21"x20' Ingersoll Slab, m.d.
36"x36"x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, m.d.
Burr Mfg., s.p.d.
Carter & Hakes Lincoln Type, motorized

PUNCHES & SHEARS

No. 6 Long & Allstatter Single End, cap. ½x½"
Cleveland Type C S.E., cap. 1 thru ½"
Cleveland Type G S.E., cap. 2" thru 1"
Robinson Lever Punch, 18" throat
Pedrick & Ayer Pneumatic Punch, 6" throat

PLANERS

24"x24"x5' G. A. Gray, m.d., 1 head
24"x24"x6' Pond, belt, 1 head
24"x24"x8' Sellers, 1 head, m.d.
30"x30"x10' American, belt, 2 heads
30"x30"x10' American, belt, 2 heads
30"x30"x14' G.A. Gray, belt, 2 heads
36"x36"x10' Niles, belt, 2 heads
36"x36"x12' Powell, m.d., 2 heads
36"x36"x12' Woodward & Powell, m.d., 3 heads
36"x36"x16' G. A. Gray, m.d., 2 heads
36"x36"x18' Niles-Bement-Pond, reversing m.d., 2 heads
36"x36"x20' Cincinnati, belt, 2 heads
36"x36"x20' G. A. Gray, belt, 2 heads
36" widened to 44"x36"x20' G. A. Gray, reversing m.d., 2 heads
42"x42"x26' G. A. Gray, m.d., 2 heads
48"x48"x30' Cincinnati, m.d., 4 heads
48"x48"x40' Sellers, reversing m.d., 2 heads
50"x48"x32" Niles-Bement-Pond, reversing m.d., 4 heads
60"x60"x16' Niles-Bement-Pond, reversing m.d., 4 heads
60"x60"x20' Cincinnati, m.d., 4 heads
60"x60"x20' G. A. Gray, m.d., 4 heads
60"x60"x40' Niles-Bement-Pond, reversing m.d., 4 heads
72"x72"x24' Niles-Bement-Pond, reversing m.d., 4 heads
96"x72"x18' Pond, m.d., 4 heads

RIVETERS

Chicago Pneumatic, 24" throat
¼" Shuster Hammer, belt
Hanna Air, 13" throat
No. 3A H.D. High Speed Riveting Hammer, m.d.

ROLLS

No. 3 Ajax Forging Rolls, m.d.
No. 4 Hilles & Jones Straightening Rolls, m.d., cap. 8'x1" plate

TURRET LATHES AND SCREW MACHINES

No. 2 Morey, m.d., bar, latest type
No. 2 Pratt & Whitney Shaver, m.d.
No. 3A Warner & Swasey Universal, chucking, m.d.
No. 3A Warner & Swasey Universal, bar, m.d.
2½x24" Jones & Lamson Geared Head Flat Turret, m.d., bar
3x36" Jones & Lamson Geared Head Flat Turret, m.d., bar
3x36" Jones & Lamson Geared Head Flat Turret, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
2 spindle 3x36" Jones & Lamson Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., bar
18" Libby Type A Turret, m.d., chucking
20"x7' American Turret, cone
24" Gisholt Turret, cone
24" Steinle Turret, m.d.
26" Libby Type C Turret, 4½" hole, m.d., chucking
26" Libby Type C Turret 7½" hole, m.d., chucking
28" Gisholt Turret, cone
Woods Tilted Turret, model D, cone
No. 5 Bardons & Oliver Universal, m.d., latest type
No. 7 Bardons & Oliver, m.d., latest type
No. 2B Foster Universal, m.d. chucking

SAWS

No. 3 and 8 Nutter & Barnes Cold Saws
20" Burke Cold Saw, belt
No. 5 and 6 Cochran-Bly Cold Saws, s.p.d.
No. 11½ Higley Cold Saw, belt
Knowlton Cold Saw, 24" blade
No. 138 Espen-Lucas Cold Saw, m.d.
No. 9A—12x15" Racine Hack Saw, m.d.
No. 15 Lea-Simplex Cold Saw

SHEET METAL MACHINERY

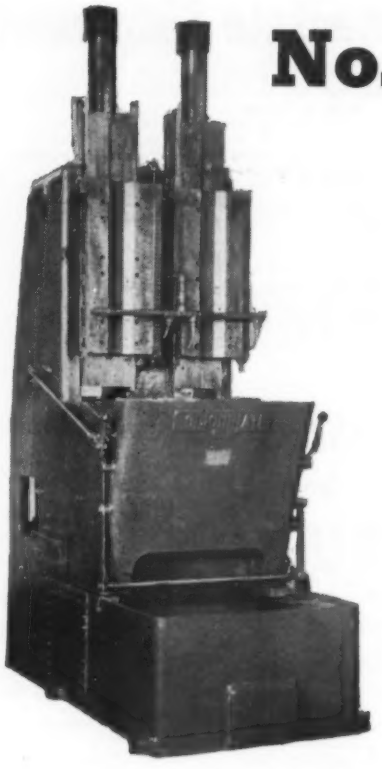
No. 2 Bethlehem Rotary Shear, 32" throat
No. 30A Quickwork Circle Shear, m.d.
No. 3 Gray Sheet Metal Cutter, 36" throat, 5/8" cap.
Southwark Rotary Metal Cutter 36" throat, 3/8" cap.
52" Covington Square Shear, 3/8" cap., belt
8' Robinson Leaf Brake, belt, cap. 10 ga.
No. 22 Williams & White Eye Bender, m.d., cap. 1½"
McCabe Pneumatic Flanger, cap. ½" plate
8' Niles-Bement-Pond Hand Flanger, ¼" cap.
No. 2 Campbell Nibbler, m.d.
Quickwork Rolling Machine, 20" throat
Magee Sheet Metal Wiring & Edging Machine, m.d.

More than 1,000 machines in stock for immediate shipment

***Main Office and Plant*—Cincinnati—Telephone Melrose 1241**
***New York Branch*—Chrysler Bldg.—Telephone MUrray Hill 4-4246**

THE EASTERN MACHINERY CO.

1004 TENNESSEE AVE. **CINCINNATI 29, OHIO**



No. 5-54 CINCINNATI

Vertical Hydraulic Duplex Surface

HYDRO-BROACH

Maximum stroke in inches 54"

Hydraulic ram movement

Maximum broach length 50"

Broaching force for which tools should be designed 10,000 lbs.

Ram speed, 31' per minute

Equipped with horizontal work table of indexing type

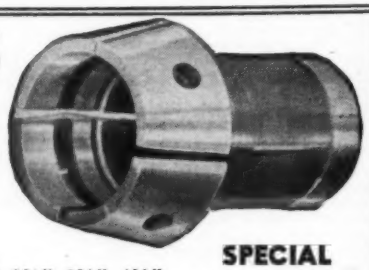
Equipped with coolant pump, ½ H.P., 3 phase, 60 cycle, 220/440 Volt Master Electric motor

Hydraulic pump driven by 20 H.P. U.S. Motor, 3 phase, 60 cycle, 220/440 Volt, 1000 R.P.M. and starter

EMERMAN MACHINERY CORP. 875 West 120th Street, Chicago 43, Ill.

USED COLLETS

FEED FINGERS — PADS



ACME No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.
ACME-GRIDLEY 1⅜"
Cleveland ⅞" to 2½".
Cone 1¼", 1½", 2½", 4".
Foster No. 1, No. 2, No. 3, No. 4, No. 5, No. 7.
Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2⅜", 3¼", 4¼".
⅞ Model "G" Gridley Form, Lead and Cut Off Cams.
No. 4 & No. 6 Warner & Swasey.
Bardons & Oliver, Brown & Sharpe, Davenport, Garvin.
LARGE STOCK OF ⅝x5 NEW BRITAINS.
Change Gears, Lead Cams, Form Cams, No. 53 to No. 56 Acme.
Spindle gears, finger holders, collet tubes, push tubes, spindles, nose pieces for 2⅜" F Gridley.
Large stock 1⅜" F. Gridley Collets.

SPECIAL
10 x 5 Browne & Sharpe Face Mill Cutters. Vertical Head for large mill.

MONA MEMBER

GRAFF MACHINE TOOL COMPANY
7140 So. Halsted Street — Vincennes 9664 — Chicago 21, Ill.

6' American Triple Purpose Plain Radial Drill, M.D.
#3 Cincinnati Vertical Milling Machine H.P.
#32 Giddings & Lewis Horiz. Boring Mill, M.D.

HEAVY DUTY MACHINE TOOLS

52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
6' Cincinnatin Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
42" Bullard New Era Vertical Turret Lathe.
#5 Cincinnati High Power Plain Milling Machine.
7' American Triple Purpose, Motor on arm.

GRINDERS

12"x96" Landis Plain, S.C.
18"x85" Landis Plain Self contained.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#1 Adams Gear Hobbers.
#1 Schuchart & Schutte Gear Hobber.
#3 Adams Farwell Gear Hobber.
#61 Fellows Gear Shaper, Cone drive.

PLANERS

96" x 96" x 36' Cincinnati 4 Hds. M.D.
48" x 48" x 24' American Planer, 4 Hds.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

SEND FOR OUR SPECIAL PRICES OF PRECISION TAPPER GROUND TAPS

High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

DE WITT TOOL COMPANY
173 GRAND STREET, NEW YORK 13, N. Y.
SEND US YOUR INQUIRIES

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

MONA MEMBER

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

PRICED EXCEPTIONALLY LOW FOR IMMEDIATE DELIVERY

LATHES

48"x24' Blocked to 80" Fifield, D.B.G.
36"x16' Niles-Bement-Pond, M.D. Q.C. G.H. Taper
2—36"x14' Niles-Bement-Pond, M.D. Q.C. G.H. Taper
36"x14' Niles-Bement-Pond, M.D.
30"x17' Blocked to 58" Houston, Stanwood & Gamble, Q.C. M.D. B.G. Grinding Attach.
24"x12' Blocked to 30" Johnson, B.G. M.D.
24"x10' Flather, Q.C. B.G. M.D.
22"x14' Fifield, S.B.G. M.D.
22"x12' Putnam, D.B.G. M.D.
18"x10' American, G.H. M.D. Taper
4—18"x8' Springfield, Q.C. D.B.G. Taper
18"x6' American, Q.C. D.B.G. Taper
16"x6' Monarch, Q.C. M.D.
15"x6' Seneca Falls, Q.C. M.D. Taper
14"x6' Prentice, G.H. Q.C.
2—7"x32" Stark, M.D.
#9—14"x20" Multi-Cut Leblond, G.H. Taper
7"x38" Rivett Bench
6"x20" Dalton Bench, M.D.
Hardinge Bench with Turret, M.D.

TURRET LATHES

6" Gisholt Tilting, 24" swing, chucking, with motor
4½" Cap. Bardons & Oliver, M.D.
3½" Potter & Johnson, G.H. M.D. without motor Serial #70008
4"x34" Jones & Lamson, G.H. Steel gears, M.D. 1930 Model
2—3"x36" Jones & Lamson, G.H.
1½" Pratt & Whitney
#3 Warner & Swasey, Hand, 1¼" Cap.
#2 Warner & Swasey, M.D.
1" Foster, M.D.
#1-B Foster Universal, Geared Head, For bar work
#6—2" Cap. Brown & Sharpe Hand Screw

BORING MILLS

72" Niles Vertical, M.D.
42" Bullard New Era Vertical
36" Bullard New Era Vertical
24" Bullard Vert. Rapid Production
5" Bausch Horizontal
4" Universal Boring Machine Co.

RADIAL DRILLS

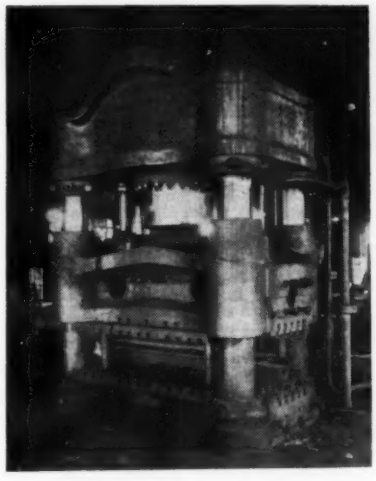
8' Carlton, M.D., late type
6' Cincinnati-Bickford, S.P.D., 15" Col.
4' Dreses, 4 step cone
3' Cincinnati-Bickford, S.P., 9" Col.
3' Niles, 3 step, 10" Col. M.D.

DRILL PRESSES

MANY TYPES AND SIZES IN STOCK

MILLERS

36"x36"x10' Ingersoll, Planer type, 4 heads, M.D.
#4 Cincinnati Plain, High Power, S.P.D.
#4 Cincinnati Plain, 3 step, D.B.G., M.D.
#4B Brown & Sharpe, S.P.D., M.D.
#4 Milwaukee, Plain, M.D.
#3-K Milwaukee, Plain, M.D., 1937 Model
#3 Cincinnati, D.B.G., M.D.
#3 Brown & Sharpe, Plain
#2 Garvin, Plain
#2B Milwaukee, Plain, S.P.D., M.D.
#5 Cincinnati High Power Universal, S.P.D., M.D.
2—#4 Cincinnati Universal, S.P.D.
#3 Cincinnati Universal, Cone, M.D.
#3 Cincinnati Universal, S.P.D., M.D.
#2A Brown & Sharpe, Universal, S.P.D., M.D.
#3 Cincinnati Vertical, S.P.D.
#08 Cincinnati Vertical, M.D., Model 1942



3000 Ton R.D. Wood Hydraulic Forging Press

#2 Brown & Sharpe, Vertical, P.F. to table, Arr. M.D.
Model C Becker, Vertical, P.F. to rotary table, M.D.
Model AB Becker, Vertical, S.P.D.
Lees-Bradner Automatic Thread Miller, M.D.
Pratt & Whitney 12"x48" Thread Miller
6¾"x18' Pratt & Whitney Automatic Miller
44"x12" Table Kempsmith, Lincoln type
#12—37"x6" table Brown & Sharpe Production, M.D.
28"x12" table Cincinnati, Production, S.P.D.
#7 Becker, Lincoln type
#OY Brown & Sharpe P.F. to table

SHAPERS

20" Steptoe, Cone, M.D.
18" Juengst, Cone, M.D.
16" Flather, Cone, M.D.
16" Smith & Mills, Cone, M.D.
14" Osborne & Sexton, Cone, M.D.
Rhodes Shaper & Slotter Combination

AUTOMATICS

#OOG, #O, #2 Brown & Sharpe
#O Brown & Sharpe, Forming
1⅝" New Britain, 6 Spindle
1¼", 1¾", 2½" Gridley, M.D.
2—#23 New Britain, 4 spindle Chuckers, S.P.D.
⅞" Cleveland, 4 spindle, M.D., Serial No. over 30,000
⅝"x7" Cleveland, M.D.

PLANERS

84"x84"x30' (60' bed) Pond, 4 heads
72"x72"x26' Sellers, 4 heads, M.D.
42"x42"x16' Niles-Bement-Pond, 3 heads, M.D.
2—42"x42"x10' Gray, 4 heads
36"x36"x12' Gray, 4 heads
30"x30"x8' Pond, 2 heads
24"x24"x6' Gray, 1 head
24"x24"x6' Bullard, 1 head

GRINDERS

#13 Brown & Sharpe Universal and Tool.
10"x36" Norton Cylindrical.
6"x18" Norton Plain, Model 1942
#70 Heald Internal, M.D.
3—#1G Abrasive Internal, bench type, M.D.
14" swing Taylor & Fenn, Internal, M.D.
#16A Blanchard Surface, M.D.
2—9" Heald Rotary Surface, M.D.
#2 Brown & Sharpe, Surface, Mag. Chuck
20"x60" table Pratt & Whitney Vertical Surface, M.D., Mag. Chuck
21½"x50½" Work. Surf. of table, Springfield, Vert. S.P. M.D.
#4 Gallmeyer & Livingston Universal Tool & Cutter, M.D.
#1½ Cincinnati Universal Tool & Cutter Newark, for finishing gear cutters

HAMMERS, PRESSES & OTHER FORGING EQUIPMENT

5" Ajax Horizontal Upsetter
2—R.D. Wood Hydraulic Forging Presses, 2500 and 3000 tons
2—Watson-Stillman Hydraulic 600 and 1000 tons
Farnham Hydraulic, 250 tons, 4 post, 4" dia.
2—Acme & Ajax Horizontal Bolt Headers, 1" & 1½"
2—2000# Billings & Spencer Board Drop Hammers
1000# Billings & Spencer Board Drop Hammer
5—Niles & Chambersburg Steam Drop Hammers, 155, 600, 1100, 1500, 3800#
2000# Steam Hammer Niles
#57 & #58 Toledo Geared Trimming Presses
#73½ Bliss Geared Trimming Press, Flywheel
25"x5"x18" Worthington Horiz. Hydraulic Pot Valve Plunger Pump
16"x26"x7"x18" Snow Steam Pump Wks. Hydraulic Pot Valve Plunger Pump
22"x11"x18" Snow Steam Pump Wks. Horiz. Hydraulic Pot Valve Plunger Pump
18"x4"x18" Worthington Horiz. Hydraulic Pot Valve Plunger Pump
R. D. Wood Accumulator 32" dia. x 18" stroke, 600 gal. cap.
#60¼ Power Press, 1200 ton, 22" stroke, 75 H.P. Motor
DD55—75 ton Ferracute Blanking & Cupping Double Action Press, 1930 Machine
#6 Williams & White Bulldozer
50 ton Bulldozer, Double Action
#2 Waterbury Header
#0 Baird Header
#S-371 Sheridan Die Press, Model 1937, M.D.
MISCELLANEOUS PRESSES, SMALLER TYPES & SIZES IN STOCK. INQUIRE FOR SPECIAL LIST.

PUNCH & SHEARS

#3 Lenox Rotary Bevel Shear, M.D.
#8 George Whiting Punch
Adlerhurst Punch & Shear, 1"x6", 25" throat
#20 Pels Punch & Shear
Pels Punch & Shear on wheels, 8" throat
#2 Bethlehem Circular Power, Gap. 30"
42" Pexto Power, 16 gauge

MISCELLANEOUS

2—#510 Campbell Abrasive Cutters, 10"x12', M.D.
8'—16 gauge Robinson Power Press Brake
6'—George A Ohl Power Brake
10'—16 gauge Dreis & Krump Brake
Rafter & Bliss 3 & 5 Head Forming Rolls, M.D.
11" Bevel Gear Generator
#12 Pratt & Whitney Profiler
1½" Acme Bolt Cutter
36" Corrugating Machine, ⅜"x⅜"
30" W. Laidlaw Bandsaw, M.D.
#1 Shuster Wire Drawing & Straightening Machine
8"x12" Robertson Hacksaw, M.D.
6"x6" Armstrong & Blum Hacksaw
2—Spot Welders, 30 and 50 K.W.

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½", No. 0G Brown & Sharpe
⅞" and 2" Cleveland Model B
1⅜" Gridley Model G 4 spindle
1⅝" New Britain 6 spindle
4½" Gridley 4-spindle Model H
No. 454 New Britain, 4-spindle chucking
14"x19" Fay automatic lathe
15" Sundstrand automatic lathe
Gisholt Simplimatic

DRILLS

Sensitive, all makes and types
21" Canedy Otto (New)
20", 21" & 24" Cincinnati upright
20" Barnes box column mfg.
22" Barnes 2-spindle, all grd, self oiling
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

No. 12 Barber Colman hobbers
No. 12 Bar. Col. long bed splining
Nos. 7 and 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimateel "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 1 G Grenby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing internal
12"x36", 16"x36" & 16"x52" Landis
6"x20", No. 10 & 6"x32" No. 11 B.&S.
10"x24", No. 1 Brown & Sharpe univ.
10"x36" & 10"x50" Norton
12"x30" No. 2 B.&S. univ., M.D.
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x32" Landis crankpin
No. 10 Blanchard surface
No. 1½ Cincinnati tool & cutter

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x6' Reed Prentice
18"x8' Boye & Emmes
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
28" Gisholt turret
8" and 12" Sundstrand Stub
15" Sundstrand automatic stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
3¼" Blomquist Eck horizontal mill
4½" Universal horizontal mill
5" Barret cylinder borer
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
No. 2 Kempsmith plain
No. 12 Brown & Sharpe Mfg. elec. drive
No. 3 Sundstrand bed type mfg. miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 4 Lees Bradner univ. thread
4" Rice Barton double spline

MISCELLANEOUS

1400' Sullivan air compressor
4"x12" & 4"x36" Sundstrand dbl. end centerers
No. 3 LaPointe double broach
6" Bignall & Keeler pipe machine
No. 2 Standard screw press, 40 ton
36"x36"x10' Hamilton planer
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1¼"—RA-6 Spindle Acme Gridley, New 1942
⅞" Cleveland Model M, four spindle
¾" Model F Gridley, four spindle
4" Model H Gridley Chucking, four spindle

DRILLS

No. C-13 Natco 16 spindle
No. 11 Natco 16 spindle
No. 3 Defiance, s.p.d., #3 Morse Taper
No. 24 Foote-Burt, s.p.d., #4 Morse Taper
6 Spindle Aveymatic, m.d.
26" Rockford sliding head, single spindle
24" Barnes Camelback
21" Canedy-Otto Single Spindle, m.d.
4' Cincinnati Bickford Radial, s.p.d.
Stecher Deep Hole, m.d., 2¼" capacity

GEAR CUTTERS

No. 5—60" Brown & Sharpe
No. 3—26" Brown & Sharpe
No. 5 Cincinnati
No. 6 Cincinnati
No. 6 Fellows Gear Shaper, m.d.
No. 13 Brown & Sharpe
No. 12 Barber-Colman Hobber
96" Gleason Spur & Bevel Gear Planer
30" Rochester Gear Tooth Rounder

GRINDERS

No. 2 Cincinnati Centerless
12" Heald Rotary Surface, s.p.d.
No. 16 Blanchard Surface, m.d.
No. 13 Brown & Sharpe Universal
No. 2 Cincinnati Universal
No. 70 Heald Internal
No. 72A3 Heald Gagematic
No. 60 Heald Internal
10x30 Landis Cylindrical
10x36 Norton Cylindrical
10x36 Hill-Clarke Cylindrical
No. 16 Brown & Sharpe Cylindrical
No. 30A Brown & Sharpe Cylindrical
76" Rogers Knife Grinder

LATHES, ENGINE

12"x10' American, c.d.
14"x10' Lodge & Shipley, c.d.
16"x 8' Pratt & Whitney, c.d.
18"x 8' American, c.d.
18"x10' Lodge & Shipley, c.d.
22"x12' Lodge & Shipley, c.d.
8"x60" Fitchburg Lo-Swing, g.h.

LATHES, TURRET

No. 4L Gisholt, 9¼" Hole in Spindle, g.h.
No. 2A Warner & Swasey, g.h.
2¼"x24" Jones & Lamson, g.h.
26" Libby, g.h.
No. 5A Potter & Johnston, g.h.
No. 4 Warner & Swasey, c.d.
No. 2 Warner & Swasey, c.d.
42" Bullard New Era V.T.L.

MILLS

No. 2B Milwaukee Universal, m.d.
No. 4 Cincinnati Plain, s.p.d.
No. 3 Cincinnati Plain, s.p.d.
No. 1½B Milwaukee, s.p.d.
No. 1½A Rockford Plain, c.d.
No. 2½B Milwaukee Vertical, s.p.d.
No. 0-S Cincinnati Vertical, m.d.
No. MM-5 U.S. Multi-Miller, m.d.
4" Pratt & Whitney Spline
No. 5 Becker Vertical, c.d.

MISCELLANEOUS

No. 6 Beatty Double End Punch & Shear
12" Williams Pipe Machine
4" Stevens Vertical Slotter
16" Betts Vertical Slotter
Kane & Roach Roll Forming Machine

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2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

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Nos. 2A, 3A W.&S., 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10, 11 Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x85' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
84"x28' Niles-Bement-Pond, 17' centers
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6, 6F Hand Screw
B. & S. No. 00, 0, 2, OG
5 Spdle Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.
⅞" Cone 4 spindle

GEAR CUTTERS

No. 2, 12 Barber-Colman Gear Hobber
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel
G. & E. 60" gear cutter

SHAPERS

15", 24" P & J.
16", 20", 26" Stockbridge

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

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10" P. & W. Auto.
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 3 Dbl. overarm, Timken Bearings
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.
Cincinnati No. 2 Universal

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5B Hammer
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D
Burr Keyseater
⅝"x5' Plate Straightening Roll
4x4x⅝" Williams & White Angle Bending Roll

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10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x30	

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#33 EX-CELL-O Thread Grinder

12" x 42" Jones & Lamson Universal Thread Grinder

#61-A Fellows Gear Shaper

#2-L Gisholt Universal Turret Lathe Bar & Chucking equipment

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Press, Forging 1000 Ton United, St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
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Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut
Straightener, Sheet 42" W-F M.D.

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CIN. BICKFORD 3½' Radial Drill
GLEASON 3", 6", 18" Bevel Gear Generators—2 tool type
GLEASON 10" & 15" Spir. Bev. Gr. Generators
GLEASON 12" Str. Bevel Gr. Generator
NORTON 24"x240" M.D. Grinder
L. & S. 36"x20' Grd. Hd. Lathe
W. & S. 3A Univ. Turret Lathe
CINCINNATI No. 3 Vert. Miller
B. & S. No. 3 Vert. Miller
P. & W. 6"x14" Thread Millers
WOODWARD & POWELL 60"x60"x20' 4 hd. Planer
CIN. 36"x36"x10' 4 hd. Planer
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SAUNDERS 8-18" Pipe Threader
TREADWELL 12" Pipe Machine
P. & W. 6" Vert. Shaper
P. & W. 10" Vert. Shaper
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GISHOLT Precision Balancing Machine
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Gridley 3¼", 4¼" 1 sp.
Potter & Johnston #6C Chuckers
Goss & Deleeuw Chucker
Cleveland 2" Model K, 4 Spindle New 1937

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Bullard 36" Rapid Production
Bertram 42" Vertical
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Niles 7' Radial
Cincinnati-Bickford 6' Radial
Pratt & Whitney Gun Barrel Drills & Rifers

GEAR CUTTERS:

Brown & Sharpe #3—26"
Fellows #64
Fellows Gear Burnisher
Gleason 6" Generator
Detroit Gear Grinders

GRINDERS:

Brown & Sharpe #3—26"
Baxter D. Whitney #23 Cylindar Grinder, Like New
Brown & Sharpe #11 Plain
Heald #70-A Internal
Heald #72-A-3 Sizematic, New 1940
Blanchard #16-26" M.D.
Norton 15"x15"x72" Surface
Hanchett Type 300 Size 48 (12"x48") Vert. Sp. Hyd. 99% new
Sav-Way Internal
Brown & Sharpe #3 Univ.
Bath 10"x23" Univ.
Cincinnati 12"x36" Univ.
Landis 20"x120", 20"x144" Plain Grinders
Cincinnati #1½ Tool & Cutter
Norton #2 Tool & Cutter
Pfauter Hob Grinder
Bryant #3B, 6, 12 18 internal
P & W 14" B.B. Vert. Surface, Model B
Farrel Roll Grinder

LATHES:

Hendey 12"x5'
Monarch 14"x6'
LeBlond 14"x6'
Sidney 17"x8'
Johnson 30"x24'

MILLERS:

Sundstrand #1—18" Rigidmil, New 1938
Cincinnati #5 Plain SPD
LeBlond #3GH—Plain
Kempsmith #4 Mazimiller, Plain
Rice-Barton Spline Millers
Becker #4B Vertical
Cincinnati #3, #4 Vertical SPD
B&S #3 Vertical SPD
Becker Model C, Vert.
Waltham Bench Thread Miller
Rowbottom Cam Miller
P & W 5", 12" Automatic
Pratt & Whitney 2" Spline Duplex
Cincinnati 12" B.G. Mfg. Becker #7H Lincoln

MISCELLANEOUS

Boring Machine—Coulter Diamond Borer
Chambering Machine—Pratt & Whitney
Chucking Machines—Potter & Johnston #6-C
Hammer—Bliss 300 Lb. Drop
Header—W-F ¾" Ball
Header—W-F #1 & #2—SSSD
Shaper—P & W 6" Vertical
Shear—Marshalltown #88 Rotary Bevel, M.D.
Tapper—Threadnut #2
Swager—Dayton #3½
Thread Roller—W-F ½" cap.
Upsetter—Acme 2" Steel

PLANERS:

Gray 36"x36"x8'
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Gray 84"x72"x18', 4 Head

PRESSES:

W-F 20 Ton Rack & Pinion
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AUTOMATICS, Acme 9/16" Mod. C 5 spd., M.D.
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AUTOMATICS, Cone, 1¼ & 1½" 4 spindle
AUTOMATICS, Gridley, ¾, 1¼, 1¾, 2¼" & 2⅝" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1¼, 1½, 2, 3½ & 5½" Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅝, 1¼ & 1½" Mod. M
AUTOMATICS, New Britain #22 and 24 Chuckers
AUTOMATICS, Potter & Johnston #5a & 6a
BORING MILLS, 30" Bullard, M.D.
BORING MILLS, Rockford, 3⅛" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GRINDER, Brown & Sharpe #5 & 12 Plain, M.D.
GRINDERS, Heald #72 Hyd. 2 M.D.
GRINDERS, Bryant #3, 6 & 18 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
LATHES, Hendey 24"x10' T.A. M.D.
LATHES, Lodge & S, 20"x10' Q.C. M.D.
MILLING MACHINES, #2 B Hog B&S Plain M.D.
MILLING MACHINES, #2B Rockford Universal
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Ingersoll 60" x 44" x 16' Adjustable Rail Planer Type Milling Machine; 4 heads on top rail, 2 left-hand side heads, one right-hand side head; motor driven.
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Brown & Sharpe No. 2 Universal Cylindrical Grinder.
Marschke 10 H.P. Swing Grinder; Late type.
Warner & Swasey No. 2 Plain Head Turret Lathe; with air chuck, M.D.
Pond 84" x 72" x 20' Planer; 4 heads, 35 H.P. D.C. motor drive and controls.
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Grob Type OS20 Open End Band Saw Machine; M. D.
Grob 20" Band Saw Filer; M.D.

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1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.
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1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18 "dia. x 9" face wheel, A.C. m.d.
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Acme #1, flat top, turret lathe, with cross sliding turret, cone drive, rigged for chucking, fine condition, 2¼ in. capacity.

Pratt & Whitney, flat top, cross sliding turret lathe, cone drive, rigged for chucking 2½ in. capacity.

Fitchburg motorized engine lathe, 6 ft. bed, 12 in. swing, center rest, compound rest, 4 way tool post, gears for threading; completely rebuilt.

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2—100" BETTS VERTICAL BORING MILLS. Table 96"x8½" thick—Motor Driven
1—102" NILES BEMENT POND TABLE 90"x 7½" thick—Motor Driven. Power Rapid Traverse.
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1942 ONAN—Portable Generator—Model V-45 4½ K. W.—6.3—KVA—V-4 Cylinder Gas Driven—110 Volt 60 Cycle—220 Volt Single Phase—Serial No. 82-42601—Weather-proof Cover—Phone for information Baldwin 1217M or ME: 3-1546.

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3 ft. AMER., Maxi-Speed Sensitive, motor on arm.
3 ft. FOSDICK, No. 4 M.T., P.F.

FLOOR: 34" BARNES, Back geared, No. 4 M.T.
32" PRENTICE, No. 5 M.T. P.F. 3½" spindle, M.D.
16" AVEY, No. 2 M.T., 12x13" table.
14" HENRY & WRIGHT, No. 2 M.T.

MULTIPLE SPINDLE: No. 12 NATCO, with 12 spindles, Motor Drive.
No. 0 FOX, arranged for 8 spindles, with 5 spindles, M.D.
8-sp., No. 4 M.T. M.D. 60" between P.F.

2 OR MORE SPINDLE: 6 spindle LELAND GIFFORD, No. 2 Morse Taper.
4 spindle BARR, B.B., No. 1 M.T.
2, 3 and 4 sp. AVEYS, 6" overhang, M.D.
4 spindle Adjustable Rail MOLINE HOLE HOG. No. 2 M.T.

PLANERS

DOUBLE HOUSING: 60"x60"x18' POND, 2 heads on Rail, M.D.
44"x36"x12' GRAY, 2 heads on rail.

OPENSIDE: 42"x44"x15' BEDFORD P.F., M.D.,
42"x45"x15' LINCOLN, P.F., M.D.
42"x45"x15' BEDFORD, P.F., M.D.
42"x36"x14' NEW ALBANY, P.F., M.D.
42"x42"x14' PATCH, P.F. M.D.
42"x40"x13' PATCH, P.F., M.D.
44"x38"x15' NEW ALBANY, P.F., M.D.

SHAPERS & SLOTTERS

72" MORTON DRAWCUT SHAPER, 18' travel.
14" Prac. New NEWTON SLOTTER, 30" table, M.D. 24" thr.
5—No. 7A DOUGLAS VERTICAL SLOTTERS, 7" str.
BETTS SLOTTER, 9" stroke, 21⅛" dia. grd. Rotary table, P.F.

GRINDERS

INTERNAL: No. 72 HEALD SIZEMATIC, Hyd. feed motor drive. No. 70 HEALD.
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No. 1 WILMARTH & MORMAN, with Univ. Grinding Att.

UNIVERSAL: No. 12 CINC. 12x36" self-cont. M.D.
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MILLS

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THREAD: 6x72" & 6x48" PRATT & WHITNEY.
No. 3 LEES BRADNER

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No. 2 BROWN & SHARPE, B.G. 10x38" table
No. 2½-B KEARNEY & TRECKER, 14x70" table
VERNON Vertical Hi-Speed, 6"x21" table, M.D.

PRODUCTION: No. 45 PRODUCTOMATIC, Rotary table.
Pract. New. 18" CINCINNATI AUTOMATICS.
10" P.&W. Semi-Auto. 6⅝"x18" table, P.F.

PLANER: 42"x42"x13' INGERSOLL SLAB, No. 5 M.T., P.F., M.D.
42"x36"x8' BEAMAN & SMITH OPENSIDE, G.M.D.

LATHES

FLOOR: 51x22' FITCHBURG, Internal Face plate Drive; D.B.G.; M.D. 8' bed ext. L.C.G.
30"x16' FIFIELD, L.C.G., B.G. Motor drive.
16"x6' PRATT & WHITNEY, grd. hd. S.P.D., T.A.
16"x7' BLAISDELL, L.C.G., back grd. M.D.
14"x6' L. & S. Q.C.G. with taper att. M.D.
14"x6' LEBLOND Q.C.G., B.G., M.D.
14"x6' BRADFORD, Grd. M.D.
14"x4' LODGE & SHIPLEY, back geared, Q.C.G.
12"x8' L. & S. TOOL ROOM, relieving & taper att.
12"x6' L. & S. TOOL ROOM, actual swing 15".
30' PIT LATHE, face plate 156", internal face plate drive.
PIT LATHE, 86" swing over ways, 115" bet. cen.

TURRET:—No. 2-A Warner & Swasey, motor drive
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Gear cutter, Gould & Eberhardt 42"
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Pipe Machine 8" Oster motor drive
Planer, 30"x30"x10' Gray; 2 heads, motor drive
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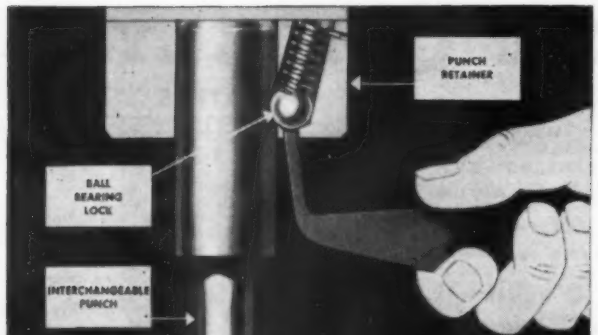
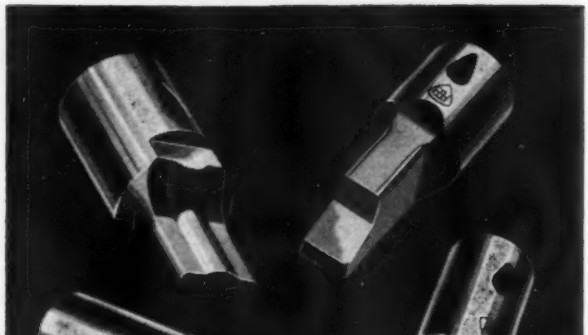
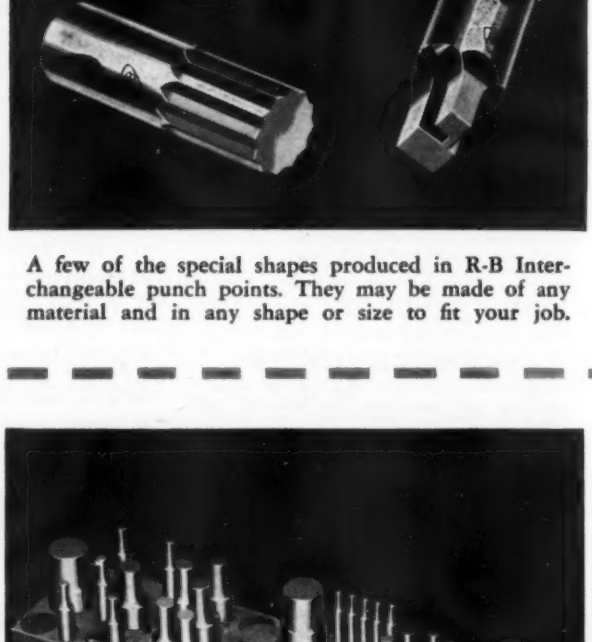


Showing the method of releasing either the punch or die simply by depressing the ball-bearing with special hand tool provided. Unnecessary to remove die from press.



A few of the special shapes produced in R-B Interchangeable punch points. They may be made of any material and in any shape or size to fit your job.

Service with a punch!



Special punch retaining plates are made where center distances are too close to use standard retainers. Hole sizes can be changed without affecting plate pattern.

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For years Allied's R-B Interchangeable Punch and Die has been in the service of the metal working industry—delivering a knock-out blow to production delays and high labor costs. Today it has become an accepted standard of efficiency in the field of laminated plastics as well. The wide application and money-saving possibilities of this "first aid" to multiple punching operations is indicated by the illustrations on this page.

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Giardino, M. D.	306
Graff Machine Tool Co.	308
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Hyman & Son, Joseph	308
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McDonald Machinery Co.	313
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Osborne & Sexton Machinery Co.	313
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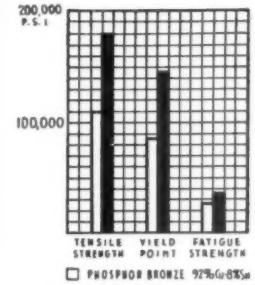
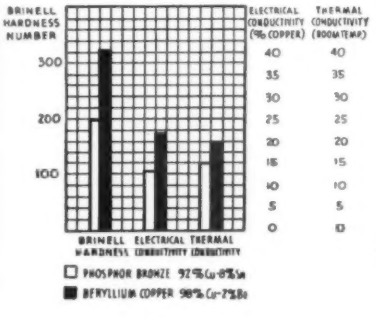
Paul's Motor & Machy. Supply	312
Reynolds Machinery Co.	313
S. & S. Machinery Co.	309
Strong, Carlisle & Hammond Co.	312
Sun Machinery Co.	313
Universal Hydraulic Machy. Co.	313
Universal Tool Co.	306
West Penn Machinery Co.	311
Zeeve & Co., Alex.	313

BERYLLIUM COPPER SCREW BLANK MACHINED IN 8½ SECONDS

New Britains Boost Vital Production 500% On B-29 Superfortress Engine Part

Beryllium Copper Screws, used as tube connections for the fuel injection system of a B-29 engine, help to accomplish the feats of these modern air battlewagons . . . bringing destruction and devastation to our enemies.





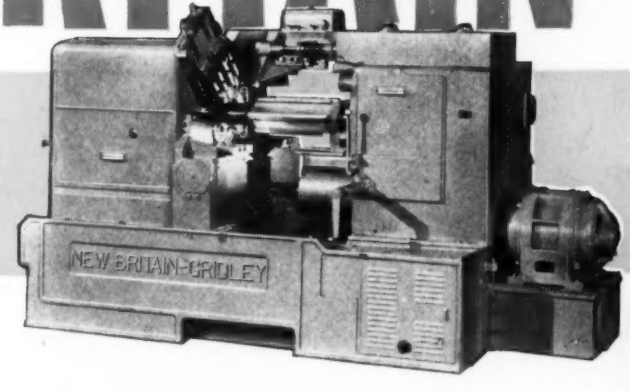
ELECTRICAL CONDUCTIVITY (% COPPER)	THERMAL CONDUCTIVITY (ROOM TEMP.)
40	40
35	35
30	30
25	25
20	20
15	15
10	10
5	5
0	0

The strategic war metal Beryllium has proved its superiority when combined with copper . . . an alloy possessing the mechanical qualities of strength and hardness of steel plus the conductivity and corrosion resistance of copper. Today's airplanes, tanks, ships, engines, instruments and communications equipment are dependent upon Beryllium Copper parts for superlative performance.

To meet the demands for B-29 bombers, parts manufacturers were called upon to step up production. A small but vital engine screw required forty-two seconds to complete the first operation on an automatic screw machine. New Britain engineering resources were tapped for the answer with the result that a New Britain now completes a finished Beryllium Copper screw blank every eight-and-one-half seconds . . . or 513 pieces gross per hour. The hardness of this alloy is C-18-22 Rockwell and machined at 260 feet per minute with spindle speeds of 1492 R.P.M. Due to the rigidity of New Britain slides, the average life of the carbide tipped tools runs 3500 to 4000 pieces per grind.

This New Britain speed and machining efficiency has not been approached with any other type of automatic and these same practices may readily apply to your present or postwar production. The automatic solution to your metal working problems can be supplied when consulting the New Britain Sales-Engineer in your area . . . or, should you prefer, write direct.

NEW BRITAIN



THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
New Britain-Gridley Machine Division

M-01014

MAKE ACCURATE LONG WEARING GAGES *From Graph-Mo Steel*

Vard Inc., have used Graph-Mo Steel for many years as material for gages that have gained an enviable record for accuracy and long service life.

Below are listed four points given by Vard Inc., as their reasons for choosing Graph-Mo Steel.

1. High production of gage blanks with minimum machine time.
2. Reduces heat treating problems.
3. Responds readily to stabilization processes.
4. Gages when finished have an exceedingly smooth surface and high polish; therefore, will give a longer wear life.

Gages are just one application where Graph-Mo, an oil hardening steel, provides outstanding performance. It is also used successfully for tools, dies, oil seals, wear plates, spindles, etc.

Graph-Mo is one of the five performance proven Timken Graphitic Steels. The others are Graph-Tung, Graph-Sil, Graph-Al and Graph-M.N.S. Each has been designed to meet specific problems. A request written on your firm's letterhead will bring a 48 page booklet that tells *where, when* and *how* to use Timken Graphitic Steels to your greatest advantage. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

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GRAPHITIC STEELS